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THE LONDON Gentleman's and Schoolmaſter's ASSISTANT;

CONTAINING

I. An Eaſy, and very Comprehenſive Syſtem of

PRACTICAL ARITHMETIC.

II. Great Variety of Bills of Parcels, Promiſſory Notes, and Receipts.

III. An Abſtract of Chronology.

IV. An extenſive Geographical Table, ſhewing the direct Diſtance, Bearing, and probable Time of Sailing from London, to the principal Places on the Earth.

V. A Number of original Queſtions as Exerciſes.

The Whole deſigned Chiefly for the Uſe of Schools.

By THOMAS WHITING,

Writing-Maſter and Teacher of the Mathematics near Weſtminſter-Bridge, Lambeth.

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ADVERTISEMENT.

YOUNG Gentleman are Boarded, and attentively Taught near Weſtminſter Bridge, Lambeth, Engliſh, Writing, Arithmetic, Book-keeping, Geometry, Trigonometry, Menſuration, Navigation, Longitude by Obſervation, Algebra, Aſtronomy, &c.

By the AUTHOR and ASSISTANTS.

PREFACE.

ARITHMETIC is a Branch of Knowledge of ſuch univerſal Importance, that this Treatiſe, intended to make the full Acquiſition of it as eaſy as poſſible, will I preſume meet with proper Encouragement. The Rules, which throughout the Book, are as ſhort as can be, are delivered, in clear, expreſſive Terms, ſo that their Meaning can never be miſunderſtood. The Examples are of that Kind which muſt certainly occur in Commerce.

Thoſe Parts of Arithmetic which are the leaſt uſeful, as Alligation, Double Fellowſhip, &c. have not many Examples given to them, thinking it very improper to detain the Scholar in Rules of little Conſequence. Their Time is employed with much more Propriety in Rules which immediately relate to Buſineſs, as the Rule of Three, or Golden Rule, Practice, Loſs and Gain, &c. or in acquiring a thorough Knowledge of both Vulgar and Decimal Fractions, Extraction of the Roots, &c. if deſigned for any Profeſſion which will make it neceſſary for them to underſtand the Mathematics.

The Bills of Parcels are printed in an open, diſtinct Manner, to induce ſuch as tranſcribe them, to write theſe, as well as whatever elſe they write, neatly and with Clearneſs.

It is not a Knowledge of Accounts alone that makes a Youth fully qualified for a Mercantile Profeſſion. I have endeavoured to ſupply what is farther neceſſary. The Forms of Promiſſory Notes, and Receipts, are two Articles extremely neceſſary for young Men in Buſineſs to be well acquainted with. A very great Variety of both theſe, is therefore given. It is frequently of uſe to a Merchant to know the Time of High-water, at the Place he reſides; it is alſo pleaſing to many to be able to determine nearly, the Moon's Age, and Southing. To find the Time of Eaſter, &c. The Day of the Week correſponding to any given Day of the Month, is very often wanted. For theſe Reaſons I have given an Abſtract of Chronology.

Geography is another eſſential Part of Commercial Education. The very great Uſe of the extenſive Table on that Subject, cannot fail of being exceedingly apparent to every one who obſerves the important Purpoſes it is intended for. The Mode of expreſſing the Situation of Places by their direct Diſtance and Bearing, conveys a more ſatisfactory Idea to thoſe who are but little converſant in Geography, than Tables of Latitudes and Longitudes; although theſe Tables are alſo of vaſt Conſequence. The Time of Sailing to any particular Place will often be found extremely uſeful.

The Utility of the Table may be greatly increaſed by a judicious Teacher, who in pointing out the principal Places, on an artificial Globe. will have an excellent Opportunity of employing his Geographical and Hiſtorical Knowledge, to the Advantage of his Scholars. The Latitude and Longitude of the Place; the Situation and Diſtance from the neareſt Places of Note; the Length of the longeſt and ſhorteſt Days; the Goverment, Produce, and very many other Particulars will occur to an intelligent Preceptor, as abſolutely neceſſary to be well explained to his Scholars, that they may become Men of Buſineſs, and Men of rational Converſation: uſeful to the Community and themſelves, and agreeable to their Friends.

The additional Queſtions, which commence at page 179, and are, as their Title expreſſes, original Ones, are deſigned as occaſional Exerciſes.

I ſhall be very happy, if upon the Whole, this Performance be favoured with Approbation, and be thought as uſeful in Schools, as I have anxiouſly endeavoured to make it.

Lambeth,
Aug. 15th, 1787. THOMAS WHITING.

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CHARACTERS IN ARITHMETIC.

$=$ Equal
$+$ Add, thus $6+8=14$
$-$ Subtract, as $9-6=3$
$\times$ Multiply $5\times 8=40$
$\div$ Divide $24\div 8=3$
Alſo $\frac{36}{4}=9$
$6:8::9:12$ the Meaning is, 6 is to 8 ſo is 9 to 12

THE

LONDON GENTLEMAN'S

AND

SCHOOLMASTER'S ASSISTANT.

NUMERATION

IS the expreſſing by Figures or Digits, any given Number in Words; and the reading of any Number that is expreſſed by Figures is called Numeration.

All Numbers are expreſſed by one or more of theſe ten Characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

When two or more of them ſtand together, the firſt on the right expreſſeth ſo many Units or Ones, the ſecond ſo many Tens, the Third ſo many Hundreds, the Fourth ſo many Thouſands, &c.

In general, it is ten Times greater for every Removal from the Place of Unity.

The following Table will ſerve as a Specimen for writing Numerically, any Number that can occur in real Uſe or Curioſity.

Hundreds of Thouſands of Millions	Tens of Thouſands of Millions	Thouſands of Millions	Hundreds of Millions	Tens of Millions	Millions	Hundreds of Thouſands	Tens of Thouſands	Thouſands	Hundreds	Tens	Units
											2
										1	1
									8	0	0
								6	0	0	7
							1	6	1	7	1
						7	3	4	1	4	7
					3	3	1	3	4	1	7
				1	2	3	4	5	6	7	8
			1	2	3	4	5	6	7	8	9
		9	8	7	6	5	4	3	2	1	0
	9	8	7	6	5	4	3	2	1	0	0
1	2	3	4	5	6	7	8	9	8	7	6

Write down in Figures, Twenty four.

24.

Write down in Figures, one Hundred and twenty one.

121.

Write down in Figures, three Thouſand, one Hundred and forty four.

3144.

Write down in Figures, ſeventy one Thouſand four Hundred and ſixty-nine.

71469.

Write down in Figures, ſix Hundred Thouſand and forty-four.

600044.

Write down in Words at length, the following Numbers, 76, 166, 1786, 71786, 146712, 1234567, 12345678, 123456789.

ADDITION.

BY Addition we are taught to bring two or more Sums into one whole or total Amount.

For inſtance, if the three Numbers 241, 912 and 129, were given, the Operation whereby their Amount is known, is called Addition.

Rule. Care muſt be had in placing the Figures in proper Order, i. e. Units under Units, Tens under Tens, &c. then beginning with the firſt Row of Units, add them up to the Top, ſet down the Units, and carry One for every Ten to the next, and ſo on, continuing to the laſt Row, at which ſet down the total Amount.

Proof. Cut off the uppermoſt Line of Figures, and find the Sum of all the reſt, then add this Amount to the Line cut off, and if it be equal to the Sum total, your Work is right.

EXAMPLE.

£	*Shillings.*	*Gallons.*	*Hogſheads.*	*Acres.*
14	167	1764	14785	714126
16	167	1671	18134	867618
81	184	1717	23456	471867
64	111	4181	81635	456718
11	471	1698	43765	129837
41	684	7146	87654	142536
227				

SUBTRACTION.

BY Subtraction we are taught to take a leſs Number from a greater, and ſhew the Difference between both. It is of two Sorts, Simple and Compound.

Of SIMPLE SUBTRACTION.

Simple Subtraction teacheth us to find the Difference between any two Numbers that are of the ſame Signification; as the Difference between 6 and 14 is 8.

RULE 1ſt. Under the greater Number, write the leſſer; ſo that Units ſtand under Units, Tens under Tens, &c. and under them draw a Line.

2d. Beginning at the Right-hand Side, take each Figure in the lower Line from the Figure ſtanding over it, and write the Difference, or what is left, under that Figure.

3d. If the under Figure be greater than the upper, increaſe the upper Figure by as many as are in an Unit of the next greater Name; from that Sum, take the Figure ſtanding under it, under which ſet the Remainder, remembering to carry one to the next under Number.

EXAMPLE.

From	12374
Take	11016
Diff.	1358
Proof	12374

PROOF. Add the two under Lines together, and if their Sum agrees with the top Line, the Work is right.

From	14674	19145	76100
Take	11213	13130	19129
Diff.			

From	186140	80000	10000
Take	118104	71410	1999
Diff.			

The Number of Examples may eaſily be enlarged by the Maſter, according as he thinks proper.

MULTIPLICATION

IS the Method of finding what a given Number will amount to, when repeated as many Times as is repreſented by another Number.

The Number to be multiplied is called the Multiplicand.

The Number you multiply by is called the Multiplier.

And the Number which ariſes from the Multiplication, is called the Product.

Multiplication is of two Sorts, Simple and Compound.

Simple Multiplication is the multiplying of any two Numbers together, without having regard to their Signification, as 8 times 11 is 88.

Before you can proceed, the following Table muſt be perfectly underſtood.

	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3		9	12	15	18	21	24	27	30	33	36
4			16	20	24	28	32	36	40	44	48
5				25	30	35	40	45	50	55	60
6					36	42	48	54	60	66	72
7						49	56	63	70	77	84
8							64	72	80	88	96
9								81	90	99	108
10									100	110	120
11										121	132
12											144

Multiplicand	674123	167456	112345617
Multiplier	2	3	4
Product	1348246		

99874345	567891234	874344876	1234987654
5	6	7	8

8901096704	140670456	1067467	14676567
9	10	11	12

When the Multiplier is any greater Number than 12

Rule. Multiply the firſt Figure of the Multiplier into every Figure of the Multiplicand.

By the ſame Rule, multiply the ſecond Figure of the Multiplier into every Figure of the Multiplicand. The firſt Figure of this Line muſt be placed under the ſecond Figure of the former Line.

Multiply, by the ſame Rule, the other Figures of the Multiplier, if there are any more, into every Figure of the Multiplicand. The firſt Figure of each Line muſt be placed under the ſecond preceding it, and thereby Tens will be under Tens, Hundreds under Hundreds, &c. For the firſt Figure of the Multiplier being Units, the firſt Product is Units; the ſecond Figure of the Multiplier being Tens, the firſt Product is Tens; the third Figuie of the Multiplier being Hundreds, the firſt Product will be Hundreds, &c.

Add all the Lines together, and the Sum is the Product required. Proof by caſting out the Nines.

EXAMPLE.

Multiply	17451
By	346
	104706
	69804
	52353
Product	6038046

Required the Product of 76845 by 146.
Required the Product of 18967656 by 198.
Required the Product of 78901467 by 6789.
Required the Product of 6845678 16 by 84567.

When there are Cyphers at the right Hand of the Multiplier or Multiplicand, or both, they may be omitted, only multiply the Figures, not regarding the Cyphers until the Work is finiſhed, then the Number of Cyphers contained in both Factors muſt be added to the right Hand of the Product.

Thus	3000
	4000
	12000000

I therefore ſay, three times 4 is 12. I then place the 6 Cyphers to the right Hand of the 12, and the Work is finiſhed.

DIVISION.

BY Diviſion we are taught to diſcover how often one Number is contained in another, and is a conciſe Way of performing many Subtractions.

To this Rule belong four principal Parts, viz.

1. The Dividend, or Number to be divided.
2. The Diviſor, or Number you divide by.
3. The Quotient, or Anſwer to the Queſtion, which ſhews how often the Diviſor is contained in the Dividend.

4. The Remainder, which is always leſs than the Diviſor, and of the ſame Name or Value as the Dividend. The Remainder is very uncertain, as there is ſometimes a very large one, and ſometimes none.

There are two Sorts of Diviſion, viz. Simple and Compound.

Simple Diviſion contains two Sorts, viz. Short and Long.

Short Diviſion is when the Diviſor does not exceed 12.

When the Diviſor is leſs than 12, find how often it is contained in the firſt Figure of the Dividend, and if any Thing remains, carry it as ſo many Tens to the next Figure, and find how often the Diviſor is contained therein, ſet it down, and continue the Operation till all be finiſhed. But if the Diviſor be more than 12, multiply it by the Quotient Figure, ſubtract the Product from the Dividend, and to the right Hand of the Remainder bring down the next Figure, and proceed till all be finiſhed.

Proof. Multiply the Diviſor and Quotient together, and the Remainder add to the Product, that Sum will be equal to the Dividend.

EXAMPLES.

2)614674 3)476765676 4)167674160

307337

5)863671674l6 6)176146761 7)18678969

8)64915678 9)1416723067 11)16767467

12)167846786

Of

Of LONG DIVISION.

Long Diviſion is when the Diviſor is more than 12; for help of the Memory we are obliged to multiply the Quotient Figure and Diviſor together, and ſubtract that Product from the Dividend, in order to find out the Remainder, which Operation muſt be continued to every Quotient Figure.

EXAMPLES.

	Diviſor.	*Dividend.*	*Quotient.*	
	123)	186786 (	1518	
		123	123	
		637	4554	
		615	3036	
			1518	
		228		
Proof by Multiplication.		123	186786	*Proof.*
		1056		
		984		
		72	*Remainder.*	

176)189678656(1489)16765432(
81676)76764678(96451)176546764671(
74167)1678674676561(96567)64567865676(
14561(467643219674(

When there are Cyphers placed at the End of the Diviſor, cut them off, and the ſame Number of Places muſt be cut off in the Dividend.

Theſe Figures which are cut off in the Dividend, muſt be annexed to the Remainder at laſt.

EXAM-

EXAMPLES.

168|00)1676465|67(76|000)46760641|111(
6764|0)6769467111|6(767|000)11111111111|111(

When the Diviſor is ſuch a Number that any two Figures, being multiplied together, will make the ſaid Diviſor, it is ſhorter to divide the given Number by one of thoſe Figures, and that Quotient by the other, as 8 times 9 is 72.

EXAMPLES.

36)4674(72)786784(81)467645(77)6965643456(

As it ſometimes happens that there is a Remainder to each of the Quotients, and neither of them the true one, it may be found by multiplying the firſt Diviſor into the laſt Remainder, which will give the true one.

MONEY.

Marked.			*Marked.*
¼ *Farthing.*	4 Farthings make	1 Penny.	*d.*
½ *Halfpenny.*	12 Pence -	1 Shilling.	*s.*
¾ *Three Farthings.*	20 Shillings -	1 Pound.	£.

Farthings.

4 = 1 Penny.
48 = 12 = 1 Shilling.
960 = 240 = 20 = Pound.

Shillings.

s.		£.	*s.*	*s.*		£.	*s.*
20	is	1 :	0	70	is	3 :	10
30	-	1 :	10	80	-	4 :	0
40	-	2 :	0	90	-	4 :	10
50	-	2 :	10	100	-	5 :	0
60	-	3 :	0				

PENCE TABLE.

d.		*s.*		*d.*	*d.*		*s.*		*d.*
20	is	1	:	8	90	is	7	:	6
24	-	2	:	0	96	-	8	:	0
30	-	2	:	6	100	-	8	:	4
36	-	3	:	0	108	-	9	:	0
40	-	3	:	4	110	-	9	:	2
48	-	4	:	0	120	-	10	:	0
50	-	4	:	2	130	-	10	:	10
60	-	5	:	0	132	-	11	:	0
70	-	5	:	10	140	-	11	:	8
72	-	6	:	0	144	-	12	:	0
80	-	6	:	8	150	-	12	:	6
84	-	7	:	0					

TROY WEIGHT.

				Marked.
24 Grains	— make	1 Pennyweight.	}	*grs.* *dwts.*
20 Pennyweights	——	1 Ounce.	- - -	*oz.*
12 Ounces	——	1 Pound.	- -	*lb.*

Grains.
24 = 1 Pennyweight.
480 = 20 = 1 Ounce.
5760 = 240 = 12 = 1 Pound.

By this Weight are weighed Gold, Silver, Jewels, Electuaries, and all Liquors.

N. B. The Standard for Gold Coin is 22 Carats of fine Gold, and 2 Carats of Copper, melted together. For Silver, is 11 *oz.* 2 *dwts.* of fine Silver, and 18 *dwts.* of Copper.

25 *lb.* is a quarter of an *cwt.* 100 *lb.* 1 *cwt.*
20 *cwt.* 1 Ton of Gold or Silver.

AVOIR-

AVOIRDUPOISE WEIGHT.

				Marked.
16 Drams	— make	1 Ounce.	—	*dr.* *oz.*
16 Ounces	——	1 Pound.	—	*lb.*
28 Pounds	——	1 Quarter.	—	*qrs.*
4 Quarters, or 112 *lb.*		1 Hundred Weight.		*cwt.*
20 Hundred Weight		1 Ton.	—	*Ton.*

Drams.

16 = 1 Ounce.
256 = 16 = 1 Pound.
7168 = 448 = 28 = 1 Quarter.
28672 = 1792 = 112 = 4 = 1 Hund. Weight.
573440 = 35840 = 2240 = 80 = 20 = 1 Ton.

There are ſeveral other Denominations in this Weight, that are uſed in particular Goods; *viz.*

	lb.		*lb.*
A Firkin of Butter -	56	A Stone of Iron Shot, or Horſeman's wt.	14
Soap -	94		
A Barrel of Anchovies	30	Butcher's Meat	8
Soap —	256	A Gallon of Train Oil	7½
Raiſins	112	A Truſs of Straw -	36
A Puncheon of Prunes	1120	New Hay	60
A Fother of Lead, 19 *cwt.* 2 *qrs.*		Old Hay -	56
		36 Truſſes a Load.	

Cheeſe and Butter.

A Clove, or Half Stone, 8 *lb.*

	lb.		*lb.*
A Wey in Suffolk, 32 Cloves, or	256	A Wey in Eſſex, 42 Cloves, or	336

Wool.

Wool.

		lb.		*lb.*
A Clove	—	7	A Wey is 6 Tod and 1 Stone, or —	182
A Stone	—	14	A Sack is 2 Weys, or	364
A Tod	—	28	A Laſt is 12 Sacks, or	4368

By this Weight is weighed any Thing of a coarſe or droſſy Nature; as all Grocery and Chandlery Wares; Bread, and all Metals but Silver and Gold.

Note. 1 Pound Avoirdupoiſe is equal to 14 *oz.* 11 *dwts.* 15 *gr.* ½ Troy.

APOTHECARIES WEIGHT.

					Marked.
20 Grains	-	make	1 Scruple	—	gr. ℈
3 Scruples	-	——	1 Dram	— —	ʒ
8 Drams	- -	——	1 Ounce	—	℥
12 Ounces	-	——	1 Pound.	—	℔

Grains.

20 = 1 Scruple.

60 = 3 = 1 Dram.

480 = 24 = 8 = 1 Ounce.

5760 = 288 = 96 = 12 = 1 Pound.

Note. The Apothecaries mix their Medicines by this Rule, but buy and ſell their Commodities by Avoirdupoiſe Weight.

The Apothecaries Pound and Ounce, and the Pound and Ounce Troy are the ſame, only differently divided and ſubdivided.

CLOTH MEASURE.

			Marked.
4 Nails	make	1 Quarter of a Yard.	*n.* *qrs.*
3 Quarters	——	1 Flemiſh Ell	*F. E.*
4 Quarters	——	1 Yard	*yd.*
5 Quarters	——	1 Engliſh Ell	*E. E.*
6 Quarters	——	1 French Ell	*Fr. E.*

Inches.

2 = 1 Nail.
9 = 4 = 1 Quarter.
36 = 16 = 4 = 1 Yard.
27 = 12 = 3 = 1 Flemiſh Ell.
45 = 20 = 5 = 1 Engliſh Ell.

LONG MEASURE.

			Marked.
3 Barley Corns	make	1 Inch	*bar.* *in.*
12 Inches	——	1 Foot	*feet.*
3 Feet	——	1 Yard	*yd.*
6 Feet	——	1 Fathom	*fth.*
5½ Yards	——	1 Rod, Pole, or Perch	*rod. p.*
40 Poles	——	1 Furlong	*fur.*
8 Furlongs	——	1 Mile	*mile.*
3 Miles	——	1 League	*lea.*
60 Miles	——	1 Degree	*deg.*

Barley Corns.

3 = 1 Inch.
36 = 12 = 1 Foot.
108 = 36 = 3 = 1 Yard.
594 = 198 = 16½ = 5½ = 1 Pole.
23760 = 7920 = 660 = 220 = 40 = 1 Furl.
190080 = 63360 = 5280 = 1760 = 320 = 8 = Mile.

N. B. A Degree is 69 Miles, 4 Furlongs, nearly, though commonly reckoned but 60 Miles.

This Meaſure is uſed to meaſure Diſtance of Places, or any Thing elſe that has Length only.

WINE MEASURE.

				Marked.
2 Pints	- -	make	1 Quart - -	*pt.* *qts.*
4 Quarts	- -	——	1 Gallon - -	*gal.*
10 Gallons	- -	——	1 Anker of Brandy	*an.*
18 Gallons	- -	——	1 Runlet - -	*run.*
$31\frac{1}{2}$ Gallons	- -	——	Half an Hogſhead	$\frac{1}{2}$ *hhd.*
42 Gallons	- -	——	1 Tierce - -	*tierce*
63 Gallons	- -	——	1 Hogſhead - -	*hhd.*
2 Hogſheads	-	——	1 Pipe, or Butt	*P.* or *Butt.*
2 Pipes, or 4 Hogſheads			1 Tun - - -	*tun.*

Inches.

$28\frac{7}{8}=$ 1 Pint.
$57\frac{3}{4}= 2 =$ 1 Quart.
$231= 8= 4=$ 1 Gallon.
$9702= 336= 168= 42=1$ Tierce.
$14553= 504= 252= 63=1\frac{1}{2}=1$ Hogſhead.
$19404= 672= 336= 84=2 =1\frac{1}{3}=1$ Puncheon.
$29106=1008= 504=126=3 =2 =1\frac{1}{2}=1$ Pipe.
$58212=2016=1008=252=6 =4 =3 =2=1$ Tun.

All Brandies, Spirits, Perry, Cyder, Mead, Vinegar, Honey, and Oil, are meaſured by this Meaſure, as alſo Milk; not by Law, but Cuſtom only.

ALE and BEER MEASURE.

			Marked.
2 Pints	make	1 Quart	*pts.* *qts.*
4 Quarts	——	1 Gallon	*gal.*
8 Gallons	——	1 Firkin of Ale	*A. fir.*
9 Gallons	——	1 Firkin of Beer	*B. fir.*
2 Firkins	——	1 Kilderkin	*Kil.*
4 Firkins, or 2 Kilderkins		1 Barrel	*Bar.*
1 Barrel and ½, or 54 Gal.		1 Hogſhead of Beer	*hhd.*
2 Barrels	——	1 Puncheon	*pun.*
3 Barrels, or 2 Hogſheads		1 Butt	*Butt.*

BEER.

Cubic Inches.

35¼ = 1 Pint.
70½ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2538 = 72 = 36 = 9 = 1 Firkin.
5076 = 144 = 72 = 18 = 2 = 1 Kilderkin.
10152 = 218 = 144 = 36 = 4 = 2 = 1 Barrel.
15228 = 432 = 216 = 54 = 6 = 3 = 1½ = 1 Hogſhead.
20304 = 576 = 288 = 72 = 8 = 4 = 2 = 1 Puncheon.
30456 = 864 = 432 = 108 = 12 = 6 = 3 = 2 = 1 Butt.

ALE.

Cubic Inches.

35¼ = 1 Pint.
70½ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2256 = 64 = 32 = 8 = 1 Firkin.
4512 = 128 = 64 = 16 = 2 = 1 Kilderkin.
9024 = 256 = 128 = 32 = 4 = 2 = 1 Barrel.
13536 = 384 = 192 = 48 = 6 = 3 = 1½ = 1 Hogſhead.

In *London* they compute but 8 Gallons to the Firkin of Ale, and 32 to the Barrel; but in all other Parts of *England*, for Ale, Strong Beer, and Small, 34 Gallons to the Barrel, and 8 Gallons and ½ to the Firkin.

N. B.	A Barrel of Salmon or Eels, is	42 Gallons.
	A Barrel of Herrings, -	32 Gallons.
	A Keg of Sturgeon, -	4 or 5 Gallons.
	A Firkin of Soap, - - -	8 Gallons.

DRY MEASURE.

					Marked.
2	Pints - -	make	1	Quart - -	*pts.* *qts.*
2	Quarts - - - -	——	1	Pottle - -	*pot.*
2	Pottles - - - -	——	1	Gallon - -	*gal.*
2	Gallons - -	——	1	Peck - - -	*pk.*
4	Pecks - - -	——	1	Buſhel - -	*bu.*
2	Buſhels - -	——	1	Strike - - -	*ſtrike.*
4	Buſhels - -	——	1	Coom - -	*coom.*
2	Cooms, or 8 Buſhels	—	1	Quarter - -	*qr.*
4	Quarters - -	——	1	Chaldron -	*chal.*
5	Quarters - -	——	1	Wey - - -	*wey.*
2	Weys - -	——	1	Laſt - - -	*laſt.*

In *London* 36 Buſhels make a Chaldron.

Solid Inches.

$268\frac{4}{5}$ = 1 Gallon.
$537\frac{3}{5}$ = 2 = 1 Peck.
$2150\frac{2}{5}$ = 8 = 4 = 1 Buſhel.
$4300\frac{4}{5}$ = 16 = 8 = 2 = 1 Strike.
$8601\frac{1}{3}$ = 32 = 16 = 4 = 2 = 1 Coom.
$17203\frac{1}{3}$ = 64 = 32 = 8 = 4 = 2 = 1 Quarter.
86106 = 320 = 160 = 40 = 20 = 10 = 5 = 1 Wey.
172032 = 640 = 320 = 80 = 40 = 20 = 10 = 2 = 1 Laſt.

The Buſhel in Water-Meaſure is 5 Pecks.
A Score of Coals is 21 Chaldron.
A Sack of Coals is 3 Buſhels.
A Chaldron of Coals is 12 Sacks.
A Load of Corn is 5 Buſhels.
A Cart Load of Ditto is 40 Buſhels.

This Meaſure is applied to all dry Goods.

The Standard Buſhel is 18 Inches and $\frac{1}{2}$ wide, and 8 Inches deep.

TIME.

			Marked.
60 Seconds	make	1 Minute	*ſec.* *m.*
60 Minutes	——	1 Hour	*hour.*
24 Hours	——	1 Day	*day.*
7 Days	——	1 Week	*week.*
4 Weeks	——	1 Month	*mo.*
13 Months, 1 Day, 6 Hours		1 Julian Year	*yr.*

Seconds.

60 = 1 Minute.
3600 = 60 = 1 Hour.
86400 = 1440 = 24 = 1 Day.
604800 = 10080 = 168 = 7 = 1 Week.
2419200 = 40320 = 672 = 28 = 4 = 1 Month.
d. h. w. d.h.
11557600=525960=8766=365.6=52.1.6=1 Ju.Y.
d. h. m. s.
31556937=525948=8765=365.5.48.57=1 Sol. Yr.

To know the Days in each Month, obſerve

Thirty Days hath September,
April, June, *and* November:
February *hath twenty-eight alone,*
All the reſt hath thirty-one;
Except in Leap-Year, *and then's the Time,*
February's *Days are twenty-and-nine.*

SQUARE MEASURE.

144 Inches - - - - - - -	make	1 Foot.
9 Feet - - - - - - -	——	1 Yard.
100 Feet - - - - - - -	——	1 Square of Flooring.
272¼ Feet - - - - - - -	——	1 Rod.
40 Rods - - - - - - -	——	1 Rood.
4 Roods, or 160 rods, or 4840 Yards		1 Acre of Land.
640 Acres - - - - - - -	——	1 Square Mile.
30 Acres - - - - - - -	——	1 Yard of Land.
100 Acres - - - - - - -	——	1 Hide of Land.

Inches.

144 = 1 Foot.
1296 = 9 = 1 Yard.
39204 = 272¼ = 30¼ = 1 Pole.
568160 = 10890 = 1210 = 40 = 1 Rood.
6272640 = 43560 = 4840 = 160 = 4 = 1 Acre.

By this Meaſure are meaſured all Things that have Length and Breadth; ſuch as Land, Painting, Plaiſtering, Flooring, Thatching, Plumbing, Glazing, &c.

SOLID MEASURE.

1728 Inches -	make	1 Solid Foot.
27 Feet - -	——	1 Yard, or Load of Earth.

40 Feet of round Timber, } is 1 Ton or Load.
Or, 40 Feet of hewn Timber, }

108 Solid Feet. *i. e.* 12 Feet in length, 3 Feet in breadth, and 3 deep; or, commonly, 14 Feet long, 3 Feet 1 Inch broad, and 3 Feet 1 Inch deep, is a Stack of Wood.

128 Solid Feet, *i. e.* 8 Feet long, 4 Feet broad, and 4 Feet deep, is a Cord of Wood.

By this Meaſure, are meaſured all Things that have Length, Breadth and Depth.

ADDITION

ADDITION *of* MONEY, WEIGHTS, *and* MEASURES.

RULE. Add the firſt Row or Denomination together, beginning at the Right Hand; then divide the Sum by as many of the ſame Denomination, as make one of the next greater, ſet down the Remainder, and carry the Quotient to the next ſuperior Denomination, and continue the ſame to the Laſt, which muſt be treated as Simple Addition.

MONEY.

£	s.	d.	£	s.	d.	£	s.	d.
3	1	1	1	1	1	11	11	1¼
6	6	4¼	7	6	6	18	18	6¼
7	1	6½	8	4	1	14	19	7
6	7	4	9	6	10¼	17	14	6¼
4	5	1½	8	4	11	18	13	1½
7	1	1¾	4	6	1½	86	11	11
34	2	7						

£	s.	d.	£	s.	d.	£	s.	d.
14	11	11¼	18	19	6¼	18	18	8½
18	16	6¾	81	11	1¼	91	19	11
16	12	1¼	60	10	0	33	13	3½
18	18	8¾	51	0	11	77	11	0
46	18	1¼	76	1	1¼	18	8	1½
11	11	11	11	7	1¼	11	11	0

TROY

TROY WEIGHT.

oz.	*dwts.*	*gr.*	*oz.*	*dwts.*	*gr.*	*lb.*	*oz.*	*dwts.*	*gr.*
1	19	23	11	11	11	11	11	19	23
6	11	1	6	10	21	18	10	11	10
11	16	13	1	1	19	11	1	18	16
11	11	11	8	16	11	19	9	14	11
16	19	21	1	1	10	11	11	11	13
10	10	0	7	18	11	16	10	0	0

AVOIRDUPOISE WEIGHT.

lb.	*oz.*	*dr.*	*lb.*	*oz.*	*dr.*	*Cwt.*	*qrs.*	*lb.*
11	15	14	1	1	1	1	1	26
16	14	11	7	1	9	7	2	19
11	10	10	1	6	10	6	1	14
14	15	11	4	11	14	1	0	27
16	13	10	6	10	12	3	1	0
11	8	6	1	12	11	1	1	0

APOTHECARIES WEIGHT.

ʒ	℈	*gr.*	℥	ʒ	℈	*gr.*	℔	℥	ʒ	℈
3	1	9	3	3	1	0	7	1	4	1
7	1	17	7	6	2	14	3	9	5	2
5	0	15	5	0	1	18	7	5	7	1
6	2	16	9	2	1	14	9	10	2	0
3	0	18	3	5	2	18	3	1	7	1
7	1	17	9	2	0	19	7	2	1	1

CLOTH

CLOTH MEASURE.

EF.	*qrs.*	*n.*	*Yds.*	*qrs.*	*n.*	*EE.*	*qrs.*	*n.*
81	2	3	41	1	2	45	4	3
74	1	2	16	3	1	11	1	2
16	0	0	11	1	3	14	2	1
54	1	1	18	2	0	44	3	0
11	1	2	15	1	2	15	1	3
51	2	1	74	3	1	11	0	0

LONG MEASURE.

F.	*in.*	*bar.*	*Yds.*	*ft.*	*in.*	*Lea.*	*m.*	*fur.*	*p.*
17	11	2	16	2	11	10	2	7	36
45	10	1	44	1	2	16	1	2	11
14	9	0	15	1	10	19	2	5	31
18	5	2	71	1	8	45	1	2	26
70	1	0	46	2	0	36	0	6	19
41	8	1	54	0	7	10	1	4	24

LAND MEASURE.

A.	*r.*	*p.*	*A.*	*r.*	*p.*	*A.*	*r.*	*p.*
27	1	14	18	3	14	11	3	11
35	2	15	15	1	20	61	1	24
97	1	16	16	2	31	11	2	11
36	2	15	11	1	24	14	1	21
75	3	27	18	3	11	11	3	11
11	1	19	16	2	10	24	1	32

WINE MEASURE.

Run.	*gal.*	*qts.*	*Tier.*	*gal.*	*qts.*	*T.*	*hhds.*	*gal.*	*qts.*
78	4	1	18	16	2	97	3	54	1
91	15	2	15	14	1	54	1	19	2
45	10	3	84	13	0	75	2	16	1
56	14	1	62	15	1	17	0	39	0
35	15	3	74	41	3	19	2	56	3
28	17	2	25	35	2	14	3	27	1

ALE and BEER MEASURE.

AB.	*ſir.*	*gal.*	*BB.*	*fir.*	*gal.*	*Hhds.*	*gal.*	*qts.*
74	0	4	35	2	5	56	38	1
95	3	7	45	0	7	55	16	1
75	1	4	78	2	5	31	32	3
96	2	0	97	3	8	17	27	1
17	3	5	54	1	7	84	11	0
25	2	7	37	2	8	11	0	1

DRY MEASURE.

Qrs.	*bu.*	*p.*	*Ch.*	*bu.*	*p.*	*Ch.*	*bu.*	*p.*
94	2	1	76	35	2	54	31	1
55	0	1	14	10	1	14	11	2
78	7	1	15	11	3	15	29	1
51	2	2	18	16	2	14	17	2
36	2	3	14	24	1	11	4	1
75	1	0	17	31	2	19	19	0

TIME.

TIME.

H.	*m.*	*s.*	*D.*	*h.*	*m.*	*W.*	*d.*	*h.*
11	59	10	4	21	40	1	6	21
17	11	40	1	20	11	7	4	11
11	10	19	6	23	49	1	1	16
74	19	11	1	12	11	4	3	14
11	18	26	5	19	54	1	0	10
45	17	49	1	11	11	5	1	17

APPLICATION.

1. A Man had four Sons, the Eldeſt was 15 Years of Age, the two next 13, and the Youngeſt 12; what was the Sum of all their Ages. *Anſ.* 53.

2. A Gentleman has in Berkſhire 741 Acres, in Wiltſhire 642, and in Glouceſterſhire 1246; how many has he in all? *Anſ.* 2629.

3. A Merchant received from A £327, from B £104, and from C 19 Thouſand, 19 Hundred and 19 Pounds: how much did he receive in all?

Anſ. £21350.

4. A Perſon has a Purſe, which contains 6 Guineas, 5 Crowns, 4 Half-crowns, 7 Sixpences, and a Moidore; how much Sterling is the Sum?

Anſ. £9 11 6.

5. A certain Number of Soldiers having plundered a City and taken a certain Quantity of Money, the Officers agree to give the common Men £397 19 $7\frac{3}{4}$, among them, and to keep the Remainder themſelves, which was juſt £4000; how much was taken in all?

Anſ. £4397 19 $7\frac{3}{4}$.

6. A Far-

A Farmer paid his Rent, 296*l.* 10*s.*—Servants Wages, 41*l.* 10*s.* 6*d.*—For a Saddle, two Guineas.—A Bridle, 3*s.* 6*d.*—A Baſket, 9*d.*—A Hat, fifteen Shillings, and for ten Oxen, one Hundred Pounds. How much did he pay in the whole? *Anſ.* 441*l.* 1*s.* 9*d.*

The Effects of a Merchant are, in Goods 5724*l.* 10*s.* 9½*d.*—In Notes 4175*l.*—The Balance of Book Debts 7612*l.* 11*s.* 10½*d.*—Bonds, one Thouſand Pounds. Furniture, 912*l.* 11*s.* 2½*d.*—And in Caſh, two Thouſand and Forty-ſeven Pounds, Four Shillings and Three Farthings. Required his whole Eſtate?

Anſ. 21471*l.* 17*s.* 11¼*d.*

A Nobleman has, in the County of Northumberland, an Eſtate worth twenty-three Thouſand, ſix Hundred and eighty-nine Pounds, thirteen Shillings and ten Pence, yearly: In Yorkſhire, an Eſtate worth five Thouſand and ſeven Pounds: And in Kent, ſixteen Thouſand, eight Hundred and two Pounds, four Shillings and eleven Pence. Required his annual Revenue?

Anſ. 45498*l.* 18*s.* 9*d.*

Two Men ſet out at the ſame Inſtant of Time; the one travels 49 Miles due North, and the other 47 due South; how far are they aſunder? *Anſ.* 96 Miles.

SUBTRACTION *of* MONEY, WEIGHTS, *and* MEASURES.

SUBTRACTION of Money, Weights, &c. commonly called Compound Subtraction, teacheth to know the Difference between any two Sums of divers Denominations.

RULE. Place thoſe Numbers under each other, which are of the ſame Denomination; the leſs being below the greater, begin with the leaſt Denomination, and if it exceed that in the upper, borrow as many Units as make one of the next greater; remembering always to add one to the next ſuperior under Number towards the left Hand for that which you borrowed.

Of MONEY.

	l.	*s.*	*d.*
From	7	4	6
Take	1	16	1
Remains	5	8	5
Proof	7	4	6

	l.	*s.*	*d.*
From	16	14	1
Take	11	11	11
Remains			
Proof			

	l.	*s.*	*d.*
From	19	1	1
Take	7	4	10¼
Remains			
Proof			

	l.	*s.*	*d.*
From	14	11	6¼
Take	11	16	4½
Remains			
Proof			

	l.	*s.*	*d.*
Borrowed	400	0	0
Paid at ſundry Times	40	7	4½
	17	11	10
	54	18	6
	49	19	6¼
Paid in all			
Remains unpaid			
Proof			

Lent

	l.	*s.*	*d.*
Lent	500	0	0
Received	10	0	0
at ſundry	19	19	0
Times	17	11	11¼
	15	15	6¼
	44	16	4¼
	59	19	11
	18	18	10
	14	16	6
	100	0	0
	94	11	11
Received in all			
To receive			
Proof			

Of AVOIRDUPOISE WEIGHT.

	tons	*cwt.*	*qr.*	*lb.*
From	19	12	1	27
Take	11	10	2	16
Remains				
Proof				

	lb.	*oz.*	*dr.*
From	14	1	1
Take	1	4	5
Remains			
Proof			

	cwt.	*qr.*	*lb.*
From	14	1	20
Take	7	2	21
Remains			
Proof			

OF TROY WEIGHT.

	lb.	*oz.*	*dwt.*	*gr.*		*oz.*	*dwt.*	*gr.*
From	110	10	14	21		12	11	10
Take	22	0	16	23		8	16	21
Remains								
Proof								

	oz.	*dwt.*	*gr.*		*lb.*	*oz.*	*dwt.*	*gr.*
From	8	14	20		141	11	13	12
Take	4	11	22		78	6	15	22
Remains								
Proof								

OF APOTHECARIES WEIGHT.

	℔	℥	ʒ	℈	*gr.*		℔	℥	ʒ	℈	*gr.*
From	15	6	3	2	13		27	8	5	0	17
Take	11	11	5	0	18		19	10	6	2	13
Remains											
Proof.											

	lb.	℥	ʒ	℈	*gr.*
From	14	11	2	1	17
Take	7	0	5	2	29
Remains					
Proof					

Of CLOTH MEASURE.

	yds.	*qr.*	*na.*	*ells.*	*qr.*	*na.*
From	81	1	3	72	3	1
Take	19	3	1	28	4	3
Remains						
Proof						

	ells fle.	*qr.*	*na.*	*ells fr.*	*qr.*	*na.*
From	56	1	3	19	3	2
Take	16	0	1	6	5	3
Remains						
Proof						

Of LONG MEASURE.

	m.	*f.*	*p.*	*l.*	*m.*	*f.*	*p.*
From	2	1	18	7	1	4	26
Take	0	4	39	2	2	2	29
Remains							
Proof							

	yds.	*f.*	*in.*	*m.*	*f.*	*p.*
From	86	1	10	18	1	6
Take	18	2	11	8	7	10
Remains						
Proof						

Of LAND MEASURE.

	a.	*r.*	*p.*		*a.*	*r.*	*p.*
From	178	1	10		2000	2	0
Take	59	3	10		706	1	18
Remains							
Proof							

	a.	*r.*	*p.*		*a.*	*r.*	*p.*
From	150	1	18		28	3	6
Take	36	3	28		17	0	19
Remains							
Proof							

Of WINE MEASURE.

	tons	*hhds.*	*gal.*	*qts.*		*hhds.*	*gal.*	*qts.*
From	5	1	15	2		13	18	0
Take	3	2	46	1		8	27	3
Remains								
Proof								

	tons	*hhd.*	*gal.*	*qts.*		*hhd.*	*gal.*	*qts.*
From	3	0	18	2		2	33	2
Take	1	3	36	3		1	39	3
Remains								
Proof								

OF WINCHESTER MEASURE.

	hhds.	*gal.*	*qts.*		*bb.*	*fir.*	*gal.*
From	33	18	2		12	0	3
Take	17	28	3		6	1	1
Remains							
Proof							

	hhd.	*gal.*	*qts.*		*ab.*	*fir.*	*gal.*
From	18	27	2		18	2	3
Take	12	19	3		10	3	7
Remains							
Proof							

Of DRY MEASURE.

	chal.	*bu.*	*p.*		*qrs.*	*bu.*	*p.*
From	108	13	2		200	6	2
Take	82	29	2		110	7	3
Remains							
Proof							

	chal.	*bu.*	*p.*		*qrs.*	*bu.*	*p.*
From	500	15	2		208	5	3
Take	228	31	3		109	6	1
Remains							
Proof							

OF TIME.

	m.	*w.*	*d.*
From	11	1	4
Take	7	3	5
Remains			
Proof			

	h.	*m.*	*s.*
From	10	46	59
Take	1	19	17
Remains			
Proof			

	d.	*h.*	*m.*	*s.*
From	5	11	14	1
Take	1	21	48	56
Remains				
Proof				

APPLICATION.

1. The Author of this Book was born in the Year 1757, how old will he be in the Year, 1789?

Anſ. 32 Years.

2. A Gentleman had a Son born on March, the 14th, and a Daughter on the 21ſt of February following, and two Years after the Birth of the Daughter, the Father was 37 Years of Age. I demand the Age of the Father at each of their Births?

Anſ. The Father's Age at the Birth of his Son, was 34 Years, and 31 Days; and at the Birth of his Daughter 35 Years.

3. A Gentleman has an Eſtate in Berkſhire, which brings in 374*l.* per Annum, and another in Wiltſhire

only 249*l.* 19. How much does the former exceed the latter in its annual Income? *Anſ.* 124*l.* 0*s.* 4*d.*

4. The Diſtance between London and the Tropic of Cancer is 1684 Miles, and between London and the Equator 3092, allowing 60 Miles to a Degree. I demand the Diſtance between the Tropic and the Equator?

Anſ. 1408 Miles.

5. I ſent my Servant to Market with ten Guineas to buy Goods; he brought from one Merchant Wares to the Amount of 1*l.* 17*s.* 5¼*d.* to another Merchant he paid three Guineas and three Quarters, his own Expences amounted to 2*s.* 7½*d.* Pray how much Money did he return me?

Anſ. 4*l.* 11*s.* 2¼*d.*

6. A Merchant failing, owed as follows, to A. 517*l.* 8*s.* 9½*d.* to B. 175*l.* to C. 107*l.* 19*s.* 11¾*d.* to D. 271*l.* 16*s.* 11*d.* and to E. 517*l.* 10*s.* 6½*d.* His Effects at that Time were as under: In Caſh, 210*l.* 11*s.* 5½*d.* in Wares, 397*l.* 17*s.* 6½*d.* in houſehold Furniture, 187*l.* 10*s.* 9*d.* and in Book Debts, 297*l.* 10*s.* 5¾*d.* How much will his Creditors loſe, ſuppoſing his Book Debts all good? *Anſ.* 496*l.* 6*s.*

COMPOUND MULTIPLICATION.

COMPOUND Multiplication is extremely uſeful in finding the Value of Goods, which will evidently appear from the Manner of working the following Examples.

CASE I.

When the Quantity does not exceed 12 Yards, Gallons, &c. ſet down the Price of 1 Yard, and place the Quantity under the leaſt Denomination of the Multiplier, and in multiplying by it, obſerve the ſame Rules as in Compound Addition, for carrying from one Denomination to another.

EXAMPLES.

	l.	*s.*	*d.*		*l.*	*s.*	*d.*
Multiply	14	14	6	Multiply	17	10	6
By			3	By			4
	44	3	6				

l.	*s.*	*d.*	*l.*	*s.*	*d.*
19	19	4	48	11	11
		5			6

l.	*s.*	*d.*	*l.*	*s.*	*d.*
7	4	11¼	11	11	7½
		7			8

l.	*s.*	*d.*	*l.*	*s.*	*d.*
48	8	10½	17	19	6
		9			10

l.	*s.*	*d.*	*l.*	*s.*	*d.*
14	14	9¾	19	7	5¼
		11			12

CASE II.

When the Multiplier is above 12, find two Numbers whoſe Product is equal to it. Multiply the given Price by either of them, and the Reſult by the other.

EXAMPLES.

Required the Value of 24 Yards at 4*s.* 7½*d.* per Yard.

OPERATION.

4 7½
6

1 7 9
4

5 11 0 *Anſwer.*

Required the Value of 60 Yards, at 2*s.* 4*d.* per Yard? *Anſ.* 7*l.*

What is the Value of 42 Gallons, at 8*s.* 11*d.* per Gallon? *Anſ.* 18*l.* 14*s.* 6*d.*

How much do 36 Ells come to, at 9*s.* 9*d.* per Ell? *Anſ.* 17*l.* 11*s.*

What is the Value of 72 Gallons of Brandy, at 12*s.* 6*d.* per Gallon? *Anſ.* 45*l.*

Bought 144 Yards of Cloth, at 13*s.* 6*d.* per Yard. What does it ſtand me in? *Anſ.* 97*l.* 4*s.*

Required the Value of 54 Ells, at 3*s.* 8*d.* per Ell? *Anſ.* 9*l.* 18*s.*

What coſt 96 Yards, at 5*s.* 4*d.* per Yard? *Anſ.* 25*l.* 12*s.*

Thirty-three Yards, at 2*s.* 7½*d.* per Yard? *Anſ.* 4*l.* 6*s.* 7½*d.*

Required the Value of 108 Yards of Cloth, at 17*s.* 10*d.* per Yard? *Anſ.* 96*l.* 6*s.*

What coſt 81 Ells, at 3*s.* 10*d.* per Ell? *Anſ.* 15*l.* 10*s.* 6*d.*

How much do 9 Parcels weigh, each weighing 3*qr.* 10*lb.* 8*oz.* 12*dr.*? *Anſ.* 7*cwt.* 2*qr.* 10*lb.* 14*oz.* 12*dr.*

What is the Content of 16 Fields, each containing 13*A.* 3*r.* 16*p.* *Anſ.* 221*A.* 2*r.* 16*p.*

CASE III.

When the Quantity is ſuch a Number that no two Numbers in the Table will produce it exactly, then multiply by two ſuch Numbers as come the neareſt to it; and for the Number wanting, multiply the Price of one Yard by the Number of Yards, and add the Products together for the Anſwer.

But if the two Numbers exceed the given Quantity, then find the Value of the overplus, and ſubtract it from the laſt Product, and the Remainder will be the Anſwer.

EXAMPLES.

What is the Value of 29 Yards of Cloth, at 14*s.* 7*d.* per Yard?

	s.	*d.*	
	14	7	Price of 1 Yard
		3	
2	3	9	Price of 3 Yards
		9	
19	13	9	Price of 27 Yards
1	9	2	Price of 2 Yards
21	2	11	Price of 29 Yards

This Queſtion may be performed by firſt finding the Value of 30 Yards, from which if you take the Price of one Yard, the Remainder will be the Value of 29 Yards as before.

What coſt 61 Yards, at 3*s.* 4½*d.* per Yard?
Anſ. 10*l.* 5*s.* 10½*d.*

What is the Value of 140¼ Yards, at 17*s.* 2*d.* per Yard? *Anſ.* 120*l.* 7*s.* 7½*d.*

What coſt 123 Gallons, at 1*l.* 15*s.* 3*d.* per Gallon?
Anſ. 216*l.* 15*s.* 9*d.*

What is the Value of 41½ Yards, at 7*s.* 9*d.* per Yard? *Anſ.* 16*l.* 1*s.* 7½*d.*

What coſt 82 Gallons of Wine, at 3*s.* 9½*d.* per Gallon? *Anſ.* 15*l.* 10*s.* 11*d.*

What is the Value of 65¾ Yards, at 2*s.* 10*d.* per Yard? *Anſ.* 9*l.* 6*s.* 3½*d.*

What is the Price of 73½ Yards, at 7*s.* 9*d.* per Yard? *Anſ.* 28*l.* 9*s.* 7*d*½.

What is the Value of 91 Yards, at 12*s.* 8*d.* per Yard? *Anſ.* 57*l.* 12*s.* 8*d.*

APPLICATION.

1. An Army conſiſting of 500 Men having plundered a City, and taken ſo much Money, that when it was ſhared among them, they received 75*l.* apiece. How much was taken in all? *Anſ.* 37500*l.*

2. What is the Weight of 5 Hogſheads of Sugar, each weighing, neat 3*cwt.* 1*qr.* 26*lb.*?
Anſ. 17*cwt.* 1*qr.* 18*lb.*

3. A Gentleman is poſſeſſed of 12 Silver Table Spoons, each weighing 2 *oz.* 14 *dwt.*; 18 of Tea ditto, each weighing 14½ *dwt.*; 2 Silver Mugs, each 13 *oz.* 17 *dwt.* and a Silver Tankard, 23 *oz.* 13 *dwt.* Pray how many Ounces of Silver has he?
Anſ. 8*lb.* 0 *oz.* 16*dwts.*

4. In 18 Pieces of Cloth, each whereof meaſures 18 Ells Engliſh 2 Quarters 3 Nails, how many Ells?
Anſ. 333*e.* 4*qr.* 2*n.*

5. How many Gallons of Wine are there in 7 Caſks, each containing 27 Gallons, 2 Quarts and 1 Pint?
Anſ. 193*gal.* 1*qt.* 1*pt.*

6. What Quantity of Yards are there in 24 Pieces of hanging Paper, each of which meaſures 11 Yards, 2 Quarters and 3 Nails? *Anſ.* 280*yds.* 2*qrs.*

COMPOUND DIVISON.

COMPOUND Diviſion is the dividing of Numbers of different Denominations; in doing which, always begin at the higheſt, and continue the Operation to the loweſt.

RULE. Divide the Price by the Quantity, beginning at the higheſt Denomination; and if any thing remain, reduce it into the next, and every inferior Denomination, and divide as before; remembering to add the odd Shillings and Pence, &c. if any, at every Reduction of their Values, and you will have the Value of unity required.

EXAMPLES.

Divide 478*l.* 18*s.* 6*d.* by 6.

	l.	*s.*	*d.*			*l.*	*s.*	*d.*
6)	478	18	6		4)	23	17	8
	79	16	5	Quotient.				
	l.	*s.*	*d.*			*l.*	*s.*	*d.*
5)	63	17	$9\frac{1}{2}$		6)	47	18	$10\frac{1}{2}$

l. s. d.
7)91 14 5¼

l. s. d.
8)28 19 4

l. s. d.
9)32 16 7½

l. s. d.
10)33 11 8

l. s. d.
11)74 18 6¼

ton. cwt. qr. lb.
4)17 12 1 18

ton. cwt. qr. lb.
5)7 11 3 27

lb. oz. dr.
6)34 12 14

lb. oz. dr.
7)8 13 15

lb. oz. dwt. gr.
6)23 10 17 22

lb. oz. dwt. gr.
7)15 11 5 18

lb. oz. dwt. gr.
8)31 6 19 4

lb. oz. dwt. gr.
9)7 4 17 15

℔ ℥ ʒ ℈ *gr.*
10)31 11 7 1 10

℔ ℥ ʒ ℈ *gr.*
11)54 6 3 2 19

yds. qr. na.	*e. e. qr. na.*	*e. fr. qr. na.*
3)14 3 1	4)59 4 0	5)17 3 0
e. fl. qr. na.	*yds. qr. na.*	*t. hhds. gal. qts.*
6)36 1 2	7) 9 2 2	3)7 3 61 3
t. hhds. gal. pts.	*hhds. gal. qts.*	*hhds. gal. pts.*
4)3 2 48 6	5)31 59 3	6)71 18 4
a. b. fir. gal.	*b. b. fir. gal.*	*a. b. fir. gal.*
5)317 3 7	6)16 2 6	8)39 2 6
b. b. fir. gal.	*ch. bu. p.*	*ch. bu. p.*
12)81 1 8	6)39 18 2	9)88 17 3
acr. r. p.	*a. r. p.*	*mi. fur. po.*
12)108 2 38	7)17 3 17	8)8 3 28
mi. fur. po.	*mo. w. d.*	*d. ho. min. ſec.*
7)17 7 19	6)8 2 6	4)18 16 31 52

A P-

APPLICATION.

1. If 6 Yards coſt 15*s*. 6*d*. what coſt one Yard?

OPERATION.

```
6)15  6
  -----
   2  7   Anſwer
      6
  -----
  15  6   Proof
  -----
```

Thoſe Queſtions are proved by multiplying the Anſwer by the ſame Number you divide by.

2. If 9 Ells coſt 2*l*. 11*s*. 3*d*. what coſt 1 Ell?
Anſ. 5*s*. 8¼*d*.

3. If 11 Yards coſt 8*l*. 3*s*. 7*d*. what coſt 1 Yard?
Anſ. 14*s*. 10½*d*.

4. If 12 Gallons of Rum coſt 5*l*. 15*s*. 6*d*. what coſt 1 Gallon? *Anſ*.

5. If 11 Yards of Cloth coſt 2*l*. 11*s*. 4*d*. what coſt 1 Yard? *Anſ*.

6. If 72 Yards coſt 45*l*. what coſt 1 Yard?
Anſ. 12*s*. 6*d*.

7. If 108 Gallons of Brandy coſt 96*l*. 6*s*. what coſt 1 Gallon? *Anſ*. 17*s*. 10*d*.

8. If 144 Gallons of Rum coſt 72*l*. what coſt 1 Gallon? *Anſ*. 10*s*.

9. Divide 7898*l*. 17*s*. 9¾*d*. equally among 576 Men? *Anſ*. 13*l* 14*s*. 3*d*. $\frac{471}{576}$

10. I demand the 447th Part of 741*l*. 17*s*. 6*d*.
Anſ. 1*l*. 13*s* 2¼*d*. $\frac{129}{447}$

11. The Multiplicand being 7454, and the Product 17986502. Pray what was the Multiplier? *Anſ*. 2413.

On the 13th of March, 1781, Mr. Herſchal, of Bath, diſcovered a Planet, called the Georgium Sidus, with a Teleſcope which magnified 200 times, and the Planet's Diſtance from the Sun being multiplied by the Power by which it was diſcovered, produced 360000 Millions of Miles. How far is this Planet from the Sun? *Anſ*. 1800 Millions of Miles.

Of REDUCTION.

REDUCTION teacheth to bring or change Numbers of one Denomination to others of different Denominations, but of the ſame Value, and is performed by Multiplication and Diviſion.

Reduction is of two Sorts, viz. Deſcending and Aſcending.

REDUCTION DESCENDING.

Rule. Multiply the higheſt Denomination given, by as many of the next leſs as make one of that greater, and thus continue till you have brought it down as low as your Queſtion requires.

Proof. Change the order of the Queſtion.

Of MONEY.

In 18*l*. 16*s*. 7*d*. How many Farthings.
20

376 Shillings
12

4519 Pence
4

Anſwer 18076 Farthings

To prove the above Queſtion, change the Order of it, and it will be, in 18076 Farthings, how many Pounds?

4)18076

12) 4519 Pence

2,0) 37,6 7 Shillings

18 16 7 Anſwer

Note. In multiplying by 20, I take in the 16 Shillings, and by 12, I take in the Pence, which muſt always be done in the like Caſes.

2. In 41*l.* 11*s.* 4¼*d.* how many Farthings? *Anſ.* 39905.

3. In 29*l.* 10*s.* how many halfpence? *Anſ.* 14160.

4. In 17 Guineas, how many Pence? *Anſ.* 4284.

5. In 19½ Guineas, how many Shillings, Pence, and Farthings? *Anſ.* 409*s.*—4914*d.*—19656*q.*

6. In 841 Crowns, how many Sixpences? *Anſ.* 8410.

7. In 75 Halfcrowns, how many Pence? *Anſ.* 2250.

8. In 1486 Threepences, how many Farthings? *Anſ.* 17832.

9. In 84 Pounds, how many Groats and Farthings? *Anſ.* 5040 Groats, 80640 Farthings.

10. In 64 Guineas, how many Farthings? *Anſ.* 64512.

11. Reduce 32 Moidores into Shillings, Pence, and Farthings? *Anſ.* 864*s.*—10368*d.*—41472*q.*

12. Reduce 74 Guineas and three Quarters, into Shillings, Sixpences, Groats, Threepences, and Farthings?

Anſ. 1569*s.*—3139 Sixpences, 4709 Groats, 6279 Threepences, 75348*q.*

REDUCTION ASCENDING.

Rule. Divide the loweſt Denomination given by as many of that Name, as make one of the next higher, and thus continue till you have brought it into that Denomination which your Queſtion requires.

1. Reduce 37744 Farthings into Pounds.

OPERATION.

4)37744

12)9436 Pence

2,0)78,6 4 Shillings

39 6 4 Anſwer

2. Reduce 68160 Farthings into Pounds? *Anſ.* 71*l.*

3. Reduce 4284 Pence into Guineas? *Anſ.* 17 Guineas.

4 Reduce 3839 Halfpence, into Pounds? *Anſ.* 7*l.* 19*s.* 11½*d.*

5 Reduce 9000 Farthings, into Pence and Half-crowns *Anſ.* 2250 Pence—75 Half-crowns.

6. Reduce 5040 Groats into Pounds? *Anſ.* 84 Pounds.

7. In 13440 Farthings, how many Crowns and Pounds? *Anſ.* 56 Crowns.—14 Pounds.

8. Reduce 64512 Farthings into Guineas? *Anſ.* 64 Guineas.

9. Reduce 41742 Farthings into Pence, Shillings, and Moidores? *Anſ.* 10368*d.*—864*s.*—32 Moidores.

10. Reduce 40656 Farthings into Pence, Groats, and Shillings? *Anſ.* 10164*d.*—2541 Groats, 847*s.*

11. In 8472 Pence, how many Shillings and Guineas? *Anſ.* 706*s.*—33 Guineas and 13*s.* over.

12. Reduce 75348 Farthings into Groats and Guineas?

Anſ. 4709 Groats, 1*d.*—74 Guineas, and 15*s.* 9*d.* over.

REDUCTION DESCENDING and ASCENDING.

Reduction Deſcending and Aſcending, is performed by both Multiplication and Diviſion.

EXAMPLES.

1. Reduce 84*l.* into Pence and Half-crowns?
Anſ. 21160*d.* – 672 Half-crowns.

2. Change 825 Crowns, into Shillings and Guineas?
Anſ. 4125*s.*—196 Guineas 9*s.*

3. Reduce 109 Half-crowns into Pence and Pounds?
Anſ. 3270*d.* – 13*l.* 12*s.* 6*d.*

4. Reduce 8174 Pence into Farthings and Guineas?
Anſ. 32696 Farthings.—31 Guineas 9*s.* 2*d.* over.

5. In 1918 Groats, how many Shillings, Moidores, and Farthings?
Anſ. 639*s.* 4*d.*—23 Moidores, 18*s.* 4*d.*—30688*q.*

6 Reduce 91 Pounds into Shillings, Guineas, Pence, and Farthings?
Anſ. 1820*s.*—86 Guineas, 14*s.*—21840*d.*—37360*q.*

REDUCTION of WEIGHTS and MEASURES.

Note. Some Sorts of Silks are weighed by a great Pound of 24 Ounces, others by the common Pound of 16 Ounces, therefore,

To bring great Pounds into common, multiply by 3, and divide by 2, or add the half of itſelf.

To bring ſmall Pounds into great, multiply by 2, and divide by 3, or ſubſtract the third of itſelf.

THINGS BOUGHT and SOLD by the TALE.

12	Dozen make	1	Groce.
12	Groce	1	Great Groce.
24	Sheets of Paper	1	Quire.
20	Quire	1	Ream.
2	Reams	1	Bundle
1	Dozen of Parchment	12	Skins.
12	Skins	1	Roll.

1. Reduce 461 great Pounds of Silk into Ounces? *Anſ.* 11064*oz.*

2. In 672 great Pounds of Silk, how many common Pounds? *Anſ.* 1008 common *lb.*

3. In 480 common Pounds of ſilk, how many great Pounds? *Anſ.* 320 great *lb.*

4. Reduce 7*cwt.* *q.* 16*lb.* of Tobacco into Pounds? *Anſ.* 828*lb.*

5. Reduce 2*t.* 17*cwt.* 39. of iron into Pounds? *Anſ.* 6468*lb.*

6. In 16*lb.* 11*oz.* 12*dr.* how many Drams? *Anſ.* 4284 Drams.

7 Reduce 17864*lb.* into tons? *Anſ.* 7*t.* 19*c.* 2*q.*

8 How many Pennyweights of Silver are there in a Tankard that weighs 2*lb.* 9½*oz*? *Anſ.* 670*dwts.*

9. In 6 Ingots of Silver, each weighing 31½ Ounces, how many Pennyweights? *Anſ.* 3780*dwts.*

10. Reduce 85440 Grains of Gold into Ounces? *Anſ.* 178*oz.*

11. In 4783 Pennyweights of Silver, how many Pounds? *Anſ.* 19*lb.* 11*oz.* 3*dwts.*

12. Reduce 2℔ 7℥ 3ʒ 2℈ 16*gr.* into grains. *Anſ.* 15116*gr.*

13. Reduce 15116 Grains into Pounds.
Anſ. 2℔ 7℥ 3ʒ 2℈ 16*gr.*

14. In 14 Pieces of Cloth, each 27$\frac{1}{4}$ Yards, how many Yards, Quarters, and Nails?
Anſ. 381$\frac{1}{2}$*yds.*—1526*qrs.* 6104*n.*

15. Reduce 20004 Nails into Ells Flemiſh.
Anſ. 1667 Ells, Flemiſh.

16. How many Inches in Length make one Mile and a half? *Anſ.* 95040 Inches.

17. How many Barley Corns will reach from London to the Cape of Good Hope, the Diſtance being 6068 Miles? *Anſ.* 1153405440 Barley Corns.

18 How many Barley Corns will reach round the World, the Circumference being 360 Degrees, and each Degree 69$\frac{1}{2}$ Miles?
Anſ. 4755801600 Barley Corns.

19. Reduce 11 Acres, 3 Roods, and 17 Poles into Poles? *Anſ.* 1897 Poles.

20. Reduce 2720 Perches into Acres?
Anſ. 17 Acres.

21. Reduce 1 Pipe of Wine into Pints?
Anſ. 1008 Pints.

22. In 1638 Quarts of Wine, how many Hogſheads? *Anſ.* 6$\frac{1}{2}$ Hogſheads.

23. Reduce 81 Barrels of Beer into Quarts.
Anſ. 11664 Quarts.

24. Reduce 3583 Pints into Barrels of Ale.
Anſ. 14 Barrels.

25. In 4184 Pecks of Coals, how many Chaldrons?
Anſ. 29*ch.* 2*buſh.*

26. In 1 Year, how many Minutes, allowing 365 Days and 6 Hours to conſtitute the ſame?

27. How many Weeks are there from March 9th to Auguſt 26th, both incluſive? *Anſ.* 24*w.* 3*d.*

The SINGLE RULE of THREE DIRECT.

WHEN, of four Numbers, there is the ſame Proportion between the two firſt, as between the two laſt, thoſe Numbers are in direct Proportion.

In all Queſtions belonging to this Rule, three Terms are given, and the fourth ſought, which four Terms will be in the above Proportion.

The firſt and laſt Terms are the Extremes, and the ſecond and third the Means.

When four Numbers are in direct Proportion, the Product of the two Extremes is equal to the Product of the two Means, that is in the Series 2 ·· 6 :: 7 ·· 21, it will be $2 \times 21 = 6 \times 7$ each being $= 42$.

The Queſtion being properly ſtated, the Anſwer may be obtained by either of the three following Rules, but the firſt is the moſt general one.

Rule 1. Multiply the ſecond and third Terms together, and divide the Product by the firſt Term; the Quotient will be the Anſwer to the Queſtion in the ſame Denomination you left your middle Number in

Rule 2. Divide the ſecond Term by the firſt, and multiply the Quotient into the third Term, and the Product will be the Anſwer.

Rule 3. Divide the third Term by the firſt, and multiply the Quotient by the ſecond Term, and the Product will be the Anſwer.

The firſt and third Terms muſt be reduced (if required) into the ſame Name or Denomination, and the middle Term to the loweſt Name mentioned.

1. If 3 Pair of Stockings coſt 6*s.* 3*d.* what coſt 12 Pair?

To obtain the Anſwer, the ſtating will ſtand as under.

Pair *s.* *d.* *Pair*
If 3 . . 6 3 : : 12
12
75
12
3)900
300 The Anſwer in Pence

Proof, by varying the order as under.

Pair *l.* *s.* *Pair*
If 12 . . 1 53
20
25
3
12)75
s. *d.*
6 3 The Anſwer

Here I reduce the middle Number into the loweſt Denomination, which is Pence, and then multiply it by the third Term, and divide that Product by the firſt Term, the Quotient will be Pence, becauſe the middle Term was reduced to Pence, which muſt be divided by 12 and 20, and you have 1*l.* 5*s.* for the Anſwer.

2. If 34 Yards coſt 16*l.* how much will 51 yards coſt?

yds. *l.* *yds.*

If 34 . . 16 :: 51 To the Anſwer

3. If 32 Yards coſt 18*l.* how much will 144 Yards coſt? *Anſ.* 81*l.*

4. If 96 Gallons coſt 15*l.* how much will 324 Gallons coſt? 50*l.* 12*s.* 6*d.*

5. If 28 Gallons coſt 15*l.* 8*s.* how much will 73 Gallons coſt? *Anſ.* 40*l.* 3*s.*

6. If 1 Yard coſt 3*s.* 1½*d.* what will 69 Yards coſt? *Anſ.* 10*l.* 15*s.* 7½*d.*

7. If 3 Yards coſt 9*s.* 3*d.* what coſt 68 Yards? *Anſ.* 10*l.* 9*s.* 8*d.*

8. If 4 Gallons coſt 11*s.* 8*d.* what coſt 67 Gallons? *Anſ.* 9*l.* 15*s.* 5*d.*

9. If 1 Yard be 1*s.* 5¼*d.* what is the Value of 65 Yards? *Anſ.* 4*l.* 13*s.* 5¼*d.*

10. If 65 Yards coſt 4*l.* 13*s.* 5¼*d.* what coſt 1 Yard? *Anſ.* 1*s.* 5¼*d.*

11. If 1 Yard coſt 1*s.* 9½*d.* what coſt 62 Yards? *Anſ.* 5*l.* 11*s.* 1*d.*

12. If 62 Yards coſt 5*l.* 11*s.* 1*d.* what coſt 1 Yard? *Anſ.* 1*s.* 9½*d.*

It will often render the Operation much more conciſe, if the firſt and ſecond, or firſt and third Terms of the ſtating be divided by their greateſt common Diviſor.

If 64 Yards coſt 4*l.* 10*s.* what will 96 Yards coſt?

Now the firſt and third Terms are diviſible by 8, therefore the operation may ſtand as under.

yds. *l.* *s.* *yds.*

If 8 4 . . 10 :: 12

In ſome Caſes the Rule of Three may performed without reducing the middle Number as under.

If 4 Yards coſt 7*s.* 6*d.* what coſt 11 Yards?

yds. *s.* *d.* *yds.*
If 4 ·· 7 6 :: 11
11
4)4 2 6
1 0 7½ Anſwer

13. Bought a Sackof Hops, containing 2 *cwt.* 3*q.* 14*lb.* for 7 Guineas and ſeven Pence, what is that per lb.? *Anſ.* 5½*d.*

14. If 1 Ton of Iron coſt 17*l.* 10*s.* what did it coſt per lb.? *Anſ.* 1¾ ½*d.*

15. If 1 lb. of Iron coſt 1¾ ½*d.* what is that per ton? *Anſ.* 17*l.* 10*s.*

16. If one Ell Engliſh coſt 3*s.* 8*d.* I demand the value of 11 Pieces, each meaſuring 31¾ yards? *Anſ.* 51*l.* 4*s.* 5½ ⅖*d.*

17. If 1 Ell of Cloth coſt 3*s.* 8*d.* what is that per yard? 2*s.* 11⅕*d.*

18. If my Income be 2*s.* 8*d.* per day, what does it amount to in a Year? *Anſ.* 48*l.* 13*s.* 4*d.*

19. If the Diſtance between London and Bath be 107 Miles, I demand how many times a Wheel will turn round in performing the Journey, whoſe Circumference is 14 Feet 2 Inches? *Anſ.* 39879$\frac{9}{17}$ Times

20. What will the Tax of 917*l.* 17*s.* 6*d.* amount to at 3*s.* 9*d.* in the Pound? *Anſ.* 172*l.* 2*s.* 0¾ ½*d.*

21. A Draper bought of a Merchant 6 Packs of Cloth, each Pack contained 6 Parcels, and each Parcel contained 10 Pieces, each Piece was 30 Yards; he gave after the Rate of 2*l.* 4*s.* 3*d.* for 3 Yards: I deſire

to know what 6 Packs coſt him, alſo the Value of 1 Yard? 7965*l.* whole coſt; 14*s.* 9*d.* per Yard.

22. A certain Tower projected upon level Ground, a Shadow to the Diſtance of 63 Yards, 1 Foot, when a Staff, 3 Feet in Length, perpendicularly erected, caſt a Shadow of 6 Feet 4 Inches; Required the Height of the Tower? *Anſ.* 90 Feet.

23. It is a Rule in ſome Pariſhes to aſſeſs the Inhabitants in proportion to two Tenths of their Rent; what is the yearly Rent of that Houſe which pays 8*l.* 10*s.* to the King, under this limitation of 4*s.* in the Pound? *Anſ.* 42*l.* 10*s.*

24. I am diſpatched on a Commiſſion from London to Edinburgh, diſtant by computation, ſuppoſe 350 Miles; and my Rout is ſettled at 22 Miles per Day, you 4 Days after are ſent after me with freſh Orders, and to go 32 Miles per Day; whereabouts on the Road ſhall I be overtaken by you?

Anſ. 68 Miles 3 Fur. 8 Po. on this ſide Edinburgh.

This Queſtion may be anſwered by firſt finding the Gain per Day, and then ſaying as the Gain per Day is to 1 Day, ſo is the Miles travelled by me in 4 Days to a fourth Number.

And then it will be as 1 Day is to the Miles travelled by you in 1 Day, ſo is the above fourth Number to another 4th Number; which being taken from 350 gives the Anſwer.

The RULE of THREE INVERSE.

INVERSE Proportion is, when more requires leſs, or leſs requires more.

RULE. Multiply the firſt and ſecond Terms together, and divide the Product by the laſt, and the Quotient will be the Anſwer.

EX-

EXAMPLES.

1. If 32 Men can build a Wall in 12 Days, how long will 48 Men be in performing the ſame?

It is evident that 48 Men will build the Wall ſooner than 32 Men; hence the juſtneſs of the above Rule.

```
   m.  d.   m.
If 32 . . 12 : : 48
   12
  ------
48)384(8        Anſwer 8 Days
   384 .
  ------
   . . .
```

2. If 30 Shillings will pay the Carriage of an hundred weight 150 Miles, how far may 6 hundred weight be carried for the ſame Money?

Anſ. 25 Miles.

3. How long will the Proviſion neceſſary for 2400 Men 16 Days, ſerve 960 Men? *Anſ.* 40 Days.

4. When the Price of a Buſhel of Wheat is 6*s.* 3*d.* the Penny Loaf will weigh 9 Ounces, what muſt the Penny Loaf weigh when Wheat is 4*s.* 6*d.* per Buſhel?

Queſtions of this kind ſeldom occur in Buſineſs.

The DOUBLE RULE of THREE DIRECT.

WHEN five Numbers are given to find a ſixth; or ſeven to find an eighth, &c. the Proportion is called compound.

RULE. Let the principal Cauſe of Loſs or Gain, Action or Paſſion, be put in the firſt Place;

That Number which betokeneth Time, Diſtance of Place, &c. be put in the Second;

And the remaining one in the Third. Place the other two under their like in the Suppoſition.

If the Blank fall under the third Term, multiply the firſt and ſecond Terms together for a Diviſor, and the other three for a Dividend.

But if the Blank fall under the firſt or ſecond Place, multiply the third and fourth together for a Diviſor, and the other three for a Dividend, and the Quotient will be the Anſwer.

Proof. By varying their order, or by two Operations in the Single Rule of Three.

EXAMPLE.

If 100*l.* in 12 Months gain 4*l.* Intereſt, what will 50*l.* gain in 9 Months?

	l.	*m.*	*l.*
If	100	12	4
	50	9	0

Here I multiply the 100 Pounds and 12 Months together for a Diviſor, and the other three for a Dividend, and the Anſwer is 1*l.* 10*s.*

Then to vary the order, it will be, If 50 Pounds in 9 Months gain 1*l.* 10*s.* what will 100*l.* gain in 12 Months? The Anſwer will evidently be 4 Pounds.

	l.	*m.*	*l.*	*s.*
If	50	9	1	10
	100	12	0	

By two ſingle Operations it will ſtand as under.

l. *l.* *s.* *l.* *l.*
If 50——1 10——100——3

m. *l.* *m.* *l.*
And if 9——3——12——4 The Anſwer

2. If 30 Men can mow 360 Acres of Graſs, in 12 Days; how many Men can mow 180 Acres in 6 Days? *Anſ.* 15 Men.

3. If 15 Men can mow 180 Acres in 6 Days, how many Men can mow 360 Acres in 12 Days? *Anſ.* 30 Men.

4. What Principal will gain 234*l.* in 8 Years at $4\frac{1}{2}$ per Cent. per Annum? *Anſ.* 650 Pounds.

5. What Principal will gain 20*l.* in 8 Months, at 6 per Cent. per Annum. *Anſ.* 500*l.*

6. If 100*l.* would defray the Expences of 5 Men for 22 Weeks, and 6 Days, how long would 12 Men be in ſpending of 150*l.* at the ſame Rate? *Anſ.* 14 Weeks and 2 Days.

PRACTICE.

PRACTICE is the moſt uſeful, and the moſt compendious Rule in Arithmetic, for by it, the Value of any Quantity of Goods at any given Price is readily obtained.

The

THE TABLE.

Parts of a Shilling.			Parts of a Pound.				Parts of a Cwt.			
d.			*s.*	*d.*			*qrs.*	*lb.*		
6	is	$\frac{1}{2}$	10	0	is	$\frac{1}{2}$	2	0	is	$\frac{1}{2}$
4	—	$\frac{1}{3}$	6	8	—	$\frac{1}{3}$	1	0	—	$\frac{1}{4}$
3	—	$\frac{1}{4}$	5	0	—	$\frac{1}{4}$	0	16	—	$\frac{1}{7}$
2	—	$\frac{1}{6}$	4	0	—	$\frac{1}{5}$	0	14	—	$\frac{1}{8}$
1$\frac{1}{2}$	—	$\frac{1}{8}$	3	4	—	$\frac{1}{6}$	0	8	—	$\frac{1}{14}$
1	—	$\frac{1}{12}$	2	6	—	$\frac{1}{8}$	0	7	—	$\frac{1}{16}$
			2	0	—	$\frac{1}{10}$				
Parts of a Penny.			1	8	—	$\frac{1}{12}$				
			1	0	—	$\frac{1}{20}$				
qr.										
1	is	$\frac{1}{4}$								
2	—	$\frac{1}{2}$								
3	—	$\frac{3}{4}$								

CASE I.

When the Price is leſs than a Penny, take the Part or Parts of a Penny, and divide by 12, and by 20, and you will have the Anſwer in Pounds, Shillings, and Pence.

$\frac{1}{4}$	$\frac{1}{4}$	7462 at 0$\frac{1}{4}$*d.*
	12	1865$\frac{1}{2}$ Pence
	2,0	15,5 5$\frac{1}{2}$ Shillings and Pence
		7 15 5$\frac{1}{2}$ Anſwer

4560

½	½	4560 at 0½
	12	2280
	2,0	19,0
		9 10 0 Anſwer

½	½	1776 at 0¾
¼	½	888
		444
	12	1332
	2,0	11,1
		5 11 0 Anſwer

CASE II.

When the Price is above a Penny, and leſs than a Shilling, take the Part or Parts of a Shilling, add them together, and divide by 20, and the Anſwer will be Pounds, Shillings, and Pence.

d.		
1	$\frac{1}{12}$	5761 at 1*d.*
	2,0	48,0 1
		24 0 1 Anſwer
		d. *l.* *s.* *d.*
		745 at 1¼ *Anſ.* 3 17 7¼

4567

		d.		*l.*	*s.*	*d.*
4567	at	1½	*Anſ.*	28	10	10½
7415	at	1¾	*Anſ.*	54	1	4¼
4100	at	2	*Anſ.*	34	3	4
754	at	2¼	*Anſ.*	7	1	4
4110	at	2½	*Anſ.*	42	16	3
770	at	2¾	*Anſ.*	8	16	5½
456	at	3	*Anſ.*	5	14	0
567	at	3¼	*Anſ.*	7	13	6
3145	at	3½	*Anſ.*	45	17	3½
1111	at	3¾	*Anſ.*	17	7	2¼
2134	at	4	*Anſ.*	35	11	4
1342	at	4¼	*Anſ.*	23	14	3½
4567	at	4½	*Anſ.*	85	12	7½
1234	at	4¾	*Anſ.*	24	8	5½
5678	at	5	*Anſ.*	118	5	10
9123	at	5¼	*Anſ.*	199	11	3¾
4567	at	5½	*Anſ.*	104	13	2½
8912	at	5¾	*Anſ.*	213	10	4
3456	at	6	*Anſ.*	86	8	0
7890	at	6¼	*Anſ.*	205	9	4½
1234	at	6½	*Anſ.*	33	8	5
5678	at	6¾	*Anſ.*	159	13	10½
4789	at	7	*Anſ.*	139	13	7
1234	at	7¼	*Anſ.*	37	4	6½
5678	at	7½	*Anſ.*	177	8	9
9123	at	7¾	*Anſ.*	294	11	11¼
4567	at	8	*Anſ.*	152	4	8
8912	at	8¼	*Anſ.*	301	7	1
3456	at	8½	*Anſ.*	122	8	0
7891	at	8¾	*Anſ.*	307	13	10½
2345	at	9	*Anſ.*	87	18	9
6789	at	9¼	*Anſ.*	256	13	2¼
1234	at	9½	*Anſ.*	48	16	11
5678	at	9¾	*Anſ.*	231	10	10½
9123	at	10	*Anſ.*	380	2	6

		d		l.	s.	d.
4567	at	10¼	*Anſ.*	145	0	11¾
8912	at	10½	*Anſ.*	389	18	0
3456	at	10¾	*Anſ.*	154	16	0
7890	at	11	*Anſ.*	361	12	6
1234	at	11¼	*Anſ.*	57	16	10½
5678	at	11½	*Anſ.*	272	1	5
9000	at	11¾	*Anſ.*	439	11	8
1234	at	12	*Anſ.*	61	14	0

CASE III.

When the Price is more than a Shilling, and leſs than two, take the Part or Parts, with as much of the given Price as is more than a Shilling, which add to the given Number, and divide by 20, and you have the Anſwer.

		d.
¼	1/48	2106 at 12¼
		43 10½
	2,0	214,9 10½
		107 9 10½ Anſwer

		d.
½	1/24	3715 at 12½
		154 9½
	2,0	386,9 9½
		193 9 9½ Anſwer

		s.	d.		l.	s.	d.
2712	at	0	12¾	*Anſ.*	144	1	6
2107	at	0	13	*Anſ.*	114	2	7
3215	at	0	13¼	*Anſ.*	177	9	10¾
2790	at	0	13½	*Anſ.*	156	18	9
7904	at	0	13¾	*Anſ.*	452	16	8
3750	at	0	14	*Anſ.*	218	15	0
3291	at	1	2¼	*Anſ.*	195	8	0¾
9254	at	1	2½	*Anſ.*	559	1	11
7250	at	1	2¾	*Anſ.*	445	11	5½
7591	at	1	3	*Anſ.*	474	8	9
6325	at	1	3¼	*Anſ.*	401	18	0¼
5271	at	1	3½	*Anſ.*	340	8	4½
3254	at	1	3¾	*Anſ.*	213	10	10½
2915	at	1	4	*Anſ.*	194	6	8
3270	at	1	4¼	*Anſ.*	221	8	1½
7059	at	1	4½	*Anſ.*	485	6	1½
2750	at	1	4¾	*Anſ.*	191	18	6½
3725	at	1	5	*Anſ.*	263	17	1
7250	at	1	5¼	*Anſ.*	521	1	10½
2597	at	1	5½	*Anſ.*	189	7	3½
7210	at	1	5¾	*Anſ.*	533	4	9½
7524	at	1	6	*Anſ.*	564	6	0
7103	at	1	6¼	*Anſ.*	540	2	5¾
3254	at	1	6½	*Anſ.*	250	16	7
7925	at	1	6¾	*Anſ.*	619	2	9¾
9271	at	1	7	*Anſ.*	733	19	1
7210	at	1	7¼	*Anſ.*	578	6	0½
2310	at	1	7½	*Anſ.*	187	13	9
2504	at	1	7¾	*Anſ.*	206	1	2
7152	at	1	8	*Anſ.*	596	0	0
2905	at	1	8¼	*Anſ.*	245	2	2¼
7104	at	1	8½	*Anſ.*	606	16	0
1004	at	1	8¾	*Anſ.*	86	16	1
2104	at	1	9	*Anſ.*	184	2	0
2571	at	1	9¼	*Anſ.*	227	12	9¾

		s.	*d.*				
2104	at	1	9½	*Anſ.*	188	9	8
7506	at	1	9¾	*Anſ.*	688	4	7½
1071	at	1	10	*Anſ.*	98	3	6
5200	at	1	10¼	*Anſ.*	482	1	8
2117	at	1	10½	*Anſ.*	198	9	4½
1007	at	1	10¾	*Anſ.*	95	9	1¼
5000	at	1	11	*Anſ.*	479	3	4
2105	at	1	11¼	*Anſ.*	203	18	5¼
5000	at	1	11½	*Anſ.*	489	11	8
4000	at	1	11¾	*Anſ.*	395	16	8

CASE IV.

When the Price conſiſts of any even Number of Shillings leſs than 20, multiply the given Quantity by half the Price, and double the firſt Figure of the Product for Shillings, and the reſt of the Product will be Pounds.

		s.	*d.*		*l.*	*s.*	*d.*
2752	at	2	0	*Anſ.*	275	4	0
3254	at	4	0	*Anſ.*	650	16	0
2710	at	6	0	*Anſ.*	813	0	0
1572	at	8	0	*Anſ.*	628	16	0
2102*	at	10	0	*Anſ.*	1051	0	0
2101	at	12	0	*Anſ.*	1260	12	0
5271	at	14	0	*Anſ.*	3689	14	0
3123	at	16	0	*Anſ.*	2498	8	0
1621	at	18	0	*Anſ.*	1458	180	

* When the Price is 10*s.* divide the given Quantity by two, and if any remains, it is 10*s.*

CASE V.

If the Price conſiſts of odd Shillings, multiply the given Quantity by the Price, and divide by 20, and you have your Deſire.

		s.	
	461 at	3	
	3		
2,0	138,3		
	l.	s.	d.
	69	3	0 Anſwer

		s.			l.	s.	d.
3271*	at	5	0	*Anſ.*	817	15	0
2715	at	7	0	*Anſ.*	950	5	0
3214	at	9	0	*Anſ.*	1446	6	0
2710	at	11	0	*Anſ.*	1490	10	0
3179	at	13	0	*Anſ.*	2066	7	0
2150	at	15	0	*Anſ.*	1612	10	0
3142	at	17	0	*Anſ.*	2670	14	0
2150	at	19	0	*Anſ.*	2042	10	0

* When the Price is 5*s.* divide the Quantity by 4, and if any remains, it is 5*s.*

CASE VI.

When the given Price are Shillings and Pence, and the aliquot Part of a Pound, divide by the aliquot Part, and you have the Anſwer at once; but if they are not an aliquot Part, then multiply the Quantity by the Shillings, and take Parts for the Reſt, add them together, and divide by 20, and you have the Anſwer.

		s.	d.		l.	s.	d.
427	at	1	8	*Anſ.*	35	11	8
478	at	2	6	*Anſ.*	59	15	0
427	at	3	4	*Anſ.*	71	3	4
456	at	6	8	*Anſ.*	152	0	0

By conſulting the Table, you will find that all the above Prices are aliquot, or even Parts of a Pound, the following are not.

		s.	d.		l.	s.	d.
4756	at	3	6½	*Anſ.*	842	4	2
1240	at	2	7	*Anſ.*	160	3	4
2041	at	5	9	*Anſ.*	586	15	9
4520	at	7	1½	*Anſ.*	1610	5	0
7456	at	11	5	*Anſ.*	4256	2	8
1200	at	4	10	*Anſ.*	290	0	0
1000	at	6	2	*Anſ.*	308	6	8
7000	at	8	3½	*Anſ.*	2902	1	8
4216	at	9	5	*Anſ.*	1985	0	8
8274	at	12	8½	*Anſ.*	5257	8	9

C A S E VII.

When the Price is Pounds, Shillings, and Pence, and the Shillings and Pence the aliquot Part of a Pound; multiply the given Quantity by the Pounds, and take Parts for the Shillings and Pence, add them together, and you have the Anſwer.

s. d.			*l.*	*s.*	*d.*	
1 8	$\frac{1}{12}$	124 at	2	1	8	
		2				
		248				
		10	6	8		
		258	6	8		Anſwer

			l.	*s.*	*d.*
		422 at	3	2	6
		Anſ.	1318	15	0

			l.	*s.*	*d.*
		1234 at	2	3	4
		Anſ.	2673	13	4

			l.	*s.*	*d.*
		1248 at	4	6	8
		Anſ.	5408	0	0

CASE VIII.

When the Price conſiſts of Pounds, Shillings, and Pence, and the Shillings and Pence, not the aliquot Part of a Pound, reduce it to Shillings, and take Parts for the Pence the ſame as directed in Caſe the ſecond, add them together, and divide by 20.

		l.	*s.*	*d.*		*l.*	*s.*	*d.*
124	at	2	7	2	*Anſ.*	292	8	8
101	—	3	2	1	——	313	10	5
206	—	1	1	5	——	220	11	10
77	—	5	1	11	——	392	7	7
59	—	1	17	10	——	111	12	2
49	—	3	11	7	——	175	7	7
106	—	2	16	1½	——	297	9	3
121	—	3	1	8¼	——	373	4	2¼
106	—	2	17	7	——	313	3	10
111	—	4	11	10	——	510	11	6
107	—	1	17	4½	——	199	19	1½
107	—	2	11	2¼	——	273	17	0¾

CASE IX.

When both the Price and Quantity are of ſeveral Denominations, multiply the Price by the integral Part as in Compound Multiplication, and take Parts for the Reſt; add them together, and you have the Anſwer.

What coſt *7cwt. 2qrs. 7lb.* at 10*l.* 11*s.* 6*d.* per cwt.

qrs		*l.*	*s.*	*d.*	
2	½	10	11	6	
				7	
lb.		74	0	6	The Price of 7 cwt.
7	⅛	5	5	9	The Price of ½ cwt.
		0	13	2½	The Price of 7 lb.
		79	19	5½	Anſwer.

What is the Value of 14*cwt.* 1*qr.* 16*lb.* at 4*l.* 17*s.* 6½*d.* per cwt.? *Anſ.* 70*l.* 3*s.* 3¼*d.*

What is the Value of 11*cwt.* 3*qrs.* 14*lb.* at 5*l.* 7*s.* 10*d.* per cwt.? *Anſ.* 64*l.* 0*s.* 6¼*d.*

What coſt 10*cwt.* 0*qrs.* 8*lb.* at 16*l.* 11*s.* 6*d.* per cwt.? *Anſ.* 166*l.* 18*s.* 8*d.*

What coſt 12*cwt.* 1*qr.* 7*lb.* at 11*l.* 11*s.* 6*d.* per cwt.? *Anſ.* 142*l.* 10*s.* 4*d.*

What coſt 18*cwt.* 1*qr.* 18*lb.* at 1*l.* 17*s.* 4*d.* per cwt. *Anſ.* 34*l.* 7*s.* 4*d.*

What coſt 16*cwt:* 3*qrs.* 19*lb.* at 2*l.* 10*s.* 6*d.* per cwt.? *Anſ.* 42*l.* 14*s.* 5¼*d.*

What coſt 2*cwt.* 2*qrs.* 20*lb.* at 6*l.* 4*s.* 4¾*d.* per cwt.? *Anſ.* 16*l.* 13*s.* 4*d.*

What coſt 14*cwt.* 3*qrs.* 21*lb.* at 5*l.* 7*s.* 9½*d.* per cwt.? *Anſ.* 80*l.* 1*s.* 4½*d.*

What coſt 8*cwt.* 0*qrs.* 21*lb.* at 7*l.* 11*s.* 10¾*d.* per cwt.? *Anſ.* 62*l.* 3*s.* 7½*d.*

TARE, TRETT and CLOFF.

TARE is an Allowance made to the Buyer for the Weight of the Box, Bag, or Veſſel, &c. and is either,

1. At ſo much per Bag, Barrel, &c.
2. At ſo much per Cent. or,
3. At ſo much in the whole groſs Weight.

TRETT is an Allowance, made by the Merchant to the Buyer of 4*lb.* in 104*lb.* which is equal to the twenty-ſixth Part, for Waſte and Duſt, in ſome ſort of Goods.

CLOFF is an Allowance of 2*lb.* to the Citizens of London, on every Draught above 3*cwt.* on ſome ſort of Goods.

Groſs Weight is the whole Weight of any ſort of Goods, and that which contains it.

Suttle is when Part of the Allowance is taken from the Groſs.

Neat is the pure Weight when all Allowances are deducted.

CASE I.

When the Tare is at ſo much per Bag, Barrel, &c. multiply the given Number of Barrels, Bags, &c. by the Tare, and ſubtract the Product from the Groſs, the Remainder is neat.

Note. To reduce Pounds into Gallons, multiply by 2, and divide by 15.

1. In 14 Hogſheads of Sugar, each 4*cwt.* 1*qr.* 16*lb.* Groſs; Tare per Hogſhead, 70*lb.* how much neat Weight?

	cwt.	*qr.*	*lb.*		*cwt.*	*qr.*	*lb.*
70	4	1	16	Or thus	4	1	16
14			2			2	14
4							
28)980(35	8	3	4		3	3	2
84			7				2
8 3.							
140	61	2	0	Groſs	7	2	4
140	8	3	0	Tare			7
. . .	52	3	0	Neat	52	3	0

2. In 70 Bales of Silk, each 317*lb.* Groſs, Tare 16*lb.* per Bale, how many Pounds neat?

Anſ. 21070 *lb.* neat.

3. In 7 Frails of Raiſins, each weighing 5*cwt.* 2*qs.* 5*lb.* Groſs, Tare 23*lb.* per Frail, how much neat Weight?

Anſ. 37*cwt.* 1*qr.* 14*lb.*

4. What is the neat Weight of 25 Hogſheads of Tobacco, each weighing Groſs 163*cwt.* 2*qrs.* 15*lb.* Tare 100*lb.* per Hogſhead? *Anſ.* 141*cwt.* 1*qr.* 7*lb.*

CASE II.

When the Tare is at ſo much in the whole groſs Weight, take the given Tare from the Groſs, the Difference is Neat.

1. What is the neat Weight of 75 Hogſheads of Tobacco, each 29*cwt.* 2*qr.* 16*lb.* Tare in the Whole 748*lb.* *Anſ.* 2216*cwt.* 2*qrs.* 4*lb.*

What is the neat Weight of 75 Barrels of Figs, each 2*qrs.* 27*lb.* groſs, Tare in the Whole, 597*lb.*
Anſ. 50*cwt.* 1*qr.*

CASE III.

When the Tare is at ſo much per Cent. and the aliquot Part or Parts of an cwt. divide the groſs Weight by ſuch Part or Parts, which ſubtract from the Groſs, and the Remainder is Neat.

1. In 12 Butts of Currants, each 7*cwt.* 1*qr.* 10*lb.* Groſs, Tare 16*lb.* per Cent. how much neat Weight?
Anſ. 75*cwt.* 1*qr.* 26*lb.* 14*oz.*

2. What is the neat Weight of 30 Barrels of Figs, each 2*cwt.* 3*qrs.* Groſs, Tare 14*lb.* per Cent.?
Anſ. 72*cwt.* 0*qrs.* 21*lb.*

CASE IV.

When the Tare is not the aliquot Part or Parts of of an Cwt. multiply the Pounds Groſs by the Tare per Cent, that Product being divided by 112, gives the Tare; which taken from the Groſs, gives the Neat.

1. In 20 Barrels of Anchovies, each 33*lb.* Groſs, Tare 10*lb.* per Cent, how much neat Weight.

Anſ. 601*lb.* 2*oz.*

2. Pray what is the neat Produce of 17 Barrels of Pot-aſh, each Groſs 203*lb.* Tare 10*lb.* per Cent?

Anſ. 3142*lb.* 14*oz.*

C A S E V.

When Trett is allowed with Tare, divide the Pounds Suttle by 26, the Quotient is the Trett, which ſubtract from the Suttle, the Remainder is Neat.

1. In 1 Butt of Currants weighing 11*cwt.* 1*qr.* 4*lb.* Groſs, Tare 14*lb.* per Cent. Trett 4 *lb.* per 104 *lb.* how many Pounds Neat?

cwt. *qr.* *lb.*
11 1 4
4

45
28

$14=\frac{1}{8}$ 1264 Groſs
158 Tare

26)1106 Suttle
42 8 Trett

1063 8 Neat

2. In 7*cwt.* 3*qrs.* 27*lb.* Groſs, Tare 36*lb.* Trett 4*lb.* per 104*lb.* how much Neat. *Anſ.* 826

3. In 177*cwt.* 0*qrs.* 22*lb.* Groſs, Tare 9*lb.* per Cent. Trett 4*lb.* per 104*lb.* how many Cwt. Neat? *Anſ.* 156*cwt.* 2*qrs.* 22*lb.*

CASE VI.

When Cloff is allowed, multiply the cwt. Suttle by two, divide the Product by 3, the Quotient will be the Pounds Cloff, which take from the Suttle, the Remainder is Neat.

1. What is the neat Weight of 3 Hogſheads of Tobacco, weighing 16*cwt.* 1*qr.* 7*lb.* Groſs, Tare 7*lb.* per Cent. Trett 4*lb.* per 104. Cloff 2*lb.* for 3 *cwt.*?

	cwt.	*qr.*	*lb.*	
$7=\frac{1}{16}$	16	1	7	Groſs
	1	0	2	Tare
	15	1	5	Suttle
		1	27	Trett
	14	3	6	Suttle
			$9\frac{3}{4}$	Cloff
	14	2	$24\frac{1}{4}$	Neat

2. In 7 Hogſheads of Tobacco, each weighing Groſs 5*cwt.* 2*qrs.* 7*lb.* Tare 8*lb.* per Cent. Trett 4*lb.* per 104. Cloff 2*lb.* for 3 Cwt. how much neat Weight? *Anſ.* 34*cwt.* 2*qrs.* 8*lb.*

VUL-

VULGAR FRACTIONS.

A VULGAR Fraction is denoted, or expreſſed by a Numerator, and a Denominator.

The Denominator ſhews the Number of Parts into which Unity, or one is ſuppoſed to be divided. The Numerator ſhews the Number of theſe Parts expreſſed by the Fraction.

Thus $\frac{7}{8}$ ſtands for ſeven Eighths, or ſeven Times the one Eighth of any Integer, or which is the ſame, it is an expreſſion for 7 divided by Eight.

There are four Sorts of Vulgar Fractions; proper, improper, compound, and mixed; *viz.*

1. A proper Fraction is when the Numerator is leſs than the Denominator, as $\frac{3}{4}$, $\frac{7}{8}$, $\frac{9}{13}$, $\frac{161}{174}$, &c.

2. An improper Fraction is known by having its Numerator greater than its Denominator, as $\frac{7}{4}$, $\frac{11}{9}$, $\frac{12}{7}$, $\frac{167}{104}$, &c.

3, A compound Fraction is the Fraction of a Fraction, as $\frac{1}{2}$ of $\frac{2}{3}$, &c.

4. A mixed Number or Fraction, is compoſed of a whole Number and Fraction, as $9\frac{2}{5}$, $14\frac{4}{5}$, &c.

REDUCTION of VULGAR FRACTIONS.

CASE I.

TO Reduce a Vulgar Fraction to a common Denominator.

RULE. Multiply each Numerator into all the Denominators but its own for a new Numerator.

Multiply all the Denominators for a common Denominator.

EX-

E X A M P L E S.

1. Reduce $\frac{3}{4}$ and $\frac{5}{9}$ to a common Denominator. *Anſ.* $\frac{27}{36}$, and $\frac{20}{36}$.

$3\times 9=27$ Firſt Numerator. $4\times 5=20$, Second Numerator: and $4\times 9=36$, the common Denominator.

2. Reduce $\frac{4}{7}$, $\frac{11}{12}$, and $\frac{8}{9}$, to a common Denominator. *Anſ.* $\frac{432}{756}$, $\frac{693}{756}$, and $\frac{672}{756}$.

3. Reduce $\frac{5}{6}$, $\frac{11}{12}$, and $\frac{21}{24}$, to a common Denominator? *Anſ.* $\frac{1440}{1728}$, $\frac{1584}{1728}$, and $\frac{1512}{1728}$.

4. Reduce $\frac{11}{13}$, $\frac{10}{19}$, and $\frac{121}{144}$, to a common Denominator. *Anſ.* $\frac{23096}{35568}$, $\frac{18720}{35568}$, and $\frac{27467}{35568}$.

5. Reduce $\frac{24}{49}$, $\frac{17}{18}$, $\frac{4}{5}$, and $\frac{7}{8}$ to a common Denominator? *Anſ.* $\frac{17280}{35280}$, $\frac{33320}{35280}$, $\frac{18784}{35280}$ and $\frac{30870}{35280}$.

6. Reduce $\frac{1}{7}$, $\frac{2}{8}$ $\frac{74}{100}$, and $\frac{11}{15}$ to a common Denominator? *Anſ.* $\frac{12000}{84000}$, $\frac{21000}{84000}$, $\frac{64160}{84000}$, and $\frac{61600}{84000}$.

C A S E II.

To reduce a given Fraction to its loweſt Terms.

Rule. Divide the lower Term by the Upper, and that Diviſor by the Remainder following, till nothing remains; the laſt Diviſor is the common Meaſure.

Divide both Parts of the Fraction by the common Meaſure, and the Quotients will compoſe the required Fraction.

E X A M P L E S.

1. Reduce $\frac{392}{448}$ to its loweſt Terms. *Anſ.* $\frac{7}{8}$.

2. Reduce $\frac{2442}{2664}$, to its loweſt Terms. *Anſ.* $\frac{11}{12}$.

3. Reduce $\frac{13332}{14443}$, to its loweſt Terms, *Anſ.* $\frac{12}{13}$.
4. Reduce $\frac{315}{336}$, to its loweſt Terms. *Anſ.* $\frac{15}{16}$.
5. Reduce $\frac{7986}{8052}$, to its loweſt Terms. *Anſ.* $\frac{121}{122}$.
6. Reduce $\frac{7992}{8064}$, to its loweſt Terms. *Anſ.* $\frac{111}{112}$.

CASE III.

To reduce a mixt Number to an improper Fraction.

Rule. Multiply the whole Number by the Denominator of the Fraction: to that Product, add the Numerator for a new Numerator, under which ſubſcribe the given Denominator.

Note. To expreſs a whole Number Fraction-wiſe, put one for its Denominator.

EXAMPLES.

1. Reduce $12\frac{2}{3}$ to an improper Fraction. *Anſ.* $\frac{38}{3}$.
2. Reduce $9\frac{8}{11}$, to an improper Fraction. *Anſ.* $\frac{107}{11}$.
3. Reduce $10\frac{11}{12}$ to an improper Fraction. *Anſ.* $\frac{131}{12}$.
4. Reduce $100\frac{19}{20}$ to an improper Fraction. *Anſ.* $\frac{2019}{20}$.
5. Reduce $8\frac{110}{116}$, to an improper Fraction? *Anſ.* $\frac{1038}{116}$.
6. Reduce $19\frac{24}{25}$, to an improper Fraction? *Anſ.* $\frac{499}{25}$.

CASE IV.

To reduce an improper Fraction to its proper Terms.

Rule. Divide the upper Term by the lower, and the Quotient will be the whole Number.

Note. This Caſe and the laſt prove each other.

EXAMPLES.

1. Reduce $\frac{38}{3}$ to its proper Terms. *Anſ.* $12\frac{2}{3}$.
2. Reduce $\frac{107}{11}$ to its proper Terms. *Anſ.* $9\frac{8}{11}$.
3. Reduce $\frac{131}{12}$ to its proper Terms. *Anſ.* $10\frac{11}{12}$.
4. Reduce $\frac{2019}{20}$ to its proper Terms. *Anſ.* $100\frac{19}{20}$.
5. Reduce $\frac{1038}{116}$ to its proper Terms. *Anſ.* $8\frac{110}{116}$.
6. Reduce $\frac{499}{25}$ to its proper Terms. *Anſ.* $19\frac{24}{25}$.

CASE V.

To reduce a compound Fraction to a ſingle one.

Rule. Multiply all the Numerators for a new Numerator, and all the Denominators for a new Denominator.

EXAMPLES.

1. Reduce $\frac{1}{2}$ of $\frac{3}{4}$ to a ſingle Fraction. *Anſ.* $\frac{3}{8}$.
2. Reduce $\frac{7}{8}$ of $\frac{9}{10}$ of $\frac{11}{12}$ to a ſingle Fraction. *Anſ.* $\frac{693}{960}$.
3. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a ſingle Fraction. *Anſ.* $\frac{6}{24}$.
4. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a ſingle Fraction. *Anſ.* $\frac{24}{60}$.

5. Reduce $\frac{1}{2}$ of $\frac{11}{12}$ of $\frac{5}{6}$ to a ſingle Fraction. *Anſ.* $\frac{55}{144}$.

6. Reduce $\frac{7}{8}$ of $\frac{8}{9}$ of $\frac{10}{11}$ to a ſingle Fraction. *Anſ.* $\frac{560}{792}$.

CASE VI.

To reduce a Fraction of one Denomination to the Fraction of another, but greater, retaining the ſame Value.

RULE. Multiply the given Denominator, by all the Denominations between that which it is in, and that which you would reduce it to, for a new Denominator; let its Numerator be the Numerator given.

EXAMPLES.

1. Reduce $\frac{3}{4}$ of a Shilling to the Fraction of a Pound. *Anſ.* $\frac{3}{80}$ is equal to $\frac{3}{4}$ of a Shilling.

2. Reduce $\frac{5}{8}$ of a Shilling to the Fraction of a Pound. *Anſ.* $\frac{5}{160}$.

3. Reduce $\frac{3}{4}$ of a Penny to the Fraction of a Pound. *Anſ.* $\frac{3}{960}$.

4. Turn $\frac{6}{7}$ of a Pound Avoirdupois into the Fraction of a cwt. *Anſ.* $\frac{6}{784}$.

5. Reduce $\frac{9}{13}$ of a Pint of Wine to the Fraction of a Hogſhead. *Anſ.* $\frac{9}{6552}$.

CASE VII.

To reduce Fractions of one Denomination, to the Fraction of another, but leſs, retaining the ſame Value.

Rule. Multiply the Numerator by the Parts contained in the ſeveral Denominations between it and that you would reduce it to, for a new Numerator, and place it over the given Denominator. Reduce the new Fraction to its loweſt Terms, by Caſe II.

Note. This Caſe, and Caſe VI. prove each other.

EXAMPLES.

1. Reduce $\frac{3}{80}$ of a Pound to the Fraction of a Shilling. *Anſ.* $\frac{3}{4}$.

2. Reduce $\frac{5}{160}$ of a Pound to the Fraction of a Shilling. *Anſ.* $\frac{5}{8}$.

3. Reduce $\frac{3}{960}$ of a Pound to the Fraction of a Penny. *Anſ.* $\frac{3}{4}$.

4. Reduce $\frac{6}{784}$ of a cwt. to the Fraction of a lb. Avoirdupois. *Anſ.* $\frac{6}{7}$.

5. Reduce $\frac{9}{6552}$ of a Hogſhead of Wine to the Fraction of a Pint. *Anſ.* $\frac{9}{13}$.

CASE VIII.

To reduce Fractions of one Denomination to another of the ſame Value; having the Numerator of the required Fraction given.

Rule. As the Numerator of the given Fraction is to its Denominator; ſo is the Numerator of the intended Fraction to its Denominator.

1. Reduce $\frac{3}{4}$ to the Fraction of the ſame Value, whoſe Numerator ſhall be 12. *Anſ.* $\frac{12}{16} = \frac{3}{4}$.

2. Reduce $\frac{4}{5}$ to the Fraction of the ſame Value, whoſe Numerator ſhall be 8. *Anſ.* $\frac{8}{10}=\frac{4}{5}$.

3. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ to the Fraction of the ſame Value, whoſe Numerator ſhall be 15. *Anſ.* $\frac{15}{45}=\frac{2}{6}$.

4. Reduce $\frac{11}{12}$ to the Fraction of the ſame Value, whoſe Numerator ſhall be 22. *Anſ.* $\frac{22}{24}=\frac{11}{12}$.

CASE IX.

To reduce Fractions of one Denomination to another of the ſame Value; having the Denominator of the required Fraction given.

Rule. As the Denominator of the given Fraction is to its Numerator; ſo is the Denominator of the intended Fraction to its Numerator.

1. Reduce $\frac{2}{3}$ to the Fraction of the ſame Value, whoſe Denominator ſhall be 12. *Anſ.* $\frac{8}{12}=\frac{2}{3}$.

2. Reduce $\frac{3}{4}$ to the Fraction of the ſame Value, whoſe Denominator ſhall be 24. *Anſ.* $\frac{18}{24}=\frac{3}{4}$.

3. Reduce $\frac{7}{8}$ to the Fraction of the ſame Value, whoſe Denominator ſhall be 16. *Anſ.* $\frac{14}{16}=\frac{7}{8}$.

4. Reduce $\frac{4}{5}$ to the Fraction of the ſame Value, whoſe Denominator ſhall be 10. *Anſ.* $\frac{8}{10}=\frac{4}{5}$.

CASE X.

To reduce a mixt Fraction to a ſingle one.

I. When the Numerator is the integral Part:

1. Multiply it by the Denominator of the fractional Part, and to that Product, add the Numerator of the fractional Part, for a new Numerator.

2. Multiply the Denominator of the Fraction by the Denominator of the fractional Part of the Numerator, for a new Denominator.

EXAMPLES.

1. Reduce $\frac{42}{49}\,\frac{7}{8}$ to a ſimple Fraction. *Anſ.* $\frac{7}{8}$.
2. Reduce $\frac{17}{43}\,\frac{4}{9}$ to a ſimple Fraction. *Anſ.* $\frac{157}{387}$

II. When the Denominator is the integral Part.

1. Multiply it by the Denominator of the fractional Part, and to that Product, add the Numerator of the fractional Part, for a new Denominator.

2. Multiply the Numerator of the Fraction, by the Denominator of the fractional Part, for a new Numerator.

EXAMPLES.

1. Reduce $\frac{43}{44}\,\frac{1}{5}$ to a ſimple Fraction. *Anſ.* $\frac{215}{221}$.
2. Reduce $\frac{51}{63}\,\frac{4}{5}$ to a ſimple Fraction. *Anſ.* $\frac{255}{319}$
3. Reduce $\frac{19}{44}\,\frac{1}{3}$ to a ſimple Fraction. *Anſ.* $\frac{3}{7}$.

CASE XI.

To find the proper Quantity of a Fraction in the known Parts of an Integer.

Rule. Multiply the Numerator by the common Parts of the Integer, and divide by the Denominator.

1. Reduce $\frac{1}{3}$ of a Pound Sterling to its proper Quantity. *Anſ.* 6*s.* 8*d.*

2. Reduce $\frac{6}{7}$ of 5*l.* 10*s.* to its proper Quantity.
Anſ. 4*l.* 14*s.* $3\frac{1}{4}$ $\frac{5}{7}$*d.*

3. Reduce $\frac{3}{4}$ of a lb. Troy to its proper Quantity.
Anſ. 9*oz.*

4. Reduce $\frac{6}{35}$ of a Tun to its proper Quantity.
Anſ. 3*cwt.* 1*qr.* 20*lb.*

5. Reduce $\frac{2}{3}$ of a lb. Apothecaries Weight to its proper Quantity. *Anſ.* 8*oz.*

6. Reduce $\frac{3}{4}$ of an ell Engliſh to its proper Quantity.
Anſ. 3*qrs.* 3*nails.*

7. Reduce $\frac{9}{11}$ of a Mile to its proper Quantity.
Anſ. 6*fur.* 21*po.* 4*yds.* 1*ft.* 6*in.*

8. Reduce $\frac{11}{12}$ of an Acre to its proper Quantity.
Anſ. 3*roods.* $26\frac{2}{3}$*poles.*

9. Reduce $\frac{3}{19}$ of a Hogſhead of Wine to its proper Quantity. *Anſ.* 9*gals.* 3*qrts.* $1\frac{11}{19}$*pts.*

10. Reduce $\frac{7}{8}$ of a Firkin of Ale to its proper Quantity. *Anſ.* 7*gals.*

11. Reduce $\frac{5}{18}$ of a Chaldron of Coals to its proper Quantity. *Anſ.* 10*buſh.*

12. Reduce $\frac{6}{7}$ of a Day to its proper Quantity.
Anſ. 20*h.* 34*min.* $17\frac{1}{7}$*ſec.*

CASE XII.

To reduce a given Quantity to the Fraction of any greater Denominator of the ſame Kind.

RULE. 1. Reduce the given Quantity to the loweſt Term mentioned for a Numerator.

2. Reduce the integral Part to the ſame Name for a Denominator, and that will be the Fraction required.

1. Reduce 6*s.* 8*d.* to the Fraction of a Pound.
Anſ. $\frac{1}{3}$.

2. Reduce 4*l.* 14*s.* $3\frac{1}{4}\frac{5}{7}$*d.* to the Fraction of 5*l.* 10*s.*
Anſ. $\frac{6}{7}$.

3. Reduce 9*oz.* Troy to the Fraction of a lb.
Anſ. $\frac{3}{4}$.

4. Reduce 3*cwt.* 1*qr.* 20*lb.* to the Fraction of a Ton. *Anſ.* $\frac{6}{35}$.

5. Reduce 8*oz.* Apothecaries to the Fraction of a *lb.*
Anſ. $\frac{2}{3}$.

6. Reduce 3*qrs.* 3*na.* to the Fraction of an Ell Engliſh. *Anſ.* $\frac{3}{4}$.

7. Reduce 6*fur.* 21*po.* 4*yds.* 1*ft.* 6*in.* to the Fraction of a mile. *Anſ.* $\frac{9}{11}$.

8. Reduce 3*rds.* $26\frac{2}{3}$*pol.* to the Fraction of an Acre.
Anſ. $\frac{11}{12}$.

9. Reduce 9*gal.* 3*qrts.* $1\frac{11}{19}$*pts.* to the Fraction of a Hogſhead of Wine. *Anſ.* $\frac{3}{19}$.

10. Reduce 7*gal.* of Ale to the Fraction of a Firkin.
Anſ. $\frac{7}{8}$.

11. Reduce 10*buſh.* of Coals to the Fraction of a Chaldron. *Anſ.* $\frac{5}{18}$.

12. Reduce 20*h.* 34*min.* $17\frac{1}{7}$*ſec.* to the Fraction of a Day. *Anſ.* $\frac{6}{7}$.

Note. Caſe 11th and 12th prove each other.

ADDITION of VULGAR FRACTIONS.

Rule. Reduce the given Fraction to a common Denominator, and add all the Numerators together, under which ſubſcribe the common Denominator.

EXAMPLES.

1. Add $\frac{4}{5}$, $\frac{2}{3}$ and $\frac{7}{12}$ of a Pound together.
Anſ. $\frac{369}{180}=2$*l.* 1*s.*

2. Add $\frac{11}{13}$, $\frac{17}{12}$, and $\frac{3}{5}$ together *Anſ.* $\frac{2233}{780}=2\frac{673}{780}$.
3. Add $51\frac{2}{5}$, $7\frac{4}{5}$, and $22\frac{1}{5}$ together. *Anſ.* $81\frac{2}{5}$.
4. Add $\frac{2}{7}$ and $\frac{2}{3}$ of $\frac{3}{5}$ of $\frac{4}{5}$ together. *Anſ.*
5. Add $5\frac{2}{3}$, and $6\frac{7}{8}$ and $4\frac{1}{2}$ together. *Anſ.* $17\frac{1}{24}$.
6. Add $\frac{3}{4}$, $\frac{2}{7}$ and $\frac{5}{6}$ together. *Anſ.* $1\frac{146}{168}$.

When the Fractions are of ſeveral Denominations, reduce them to their proper Quantities, and add as before.

7. Add the $\frac{3}{4}$ of a Pound to the $\frac{19}{24}$ of a Shilling. *Anſ.* 15*s.* 9*d.* 2*qrs.*
8. Add $\frac{3}{4}$ of a Pound Troy to the $\frac{1}{6}$ of an Ounce. *Anſ* 9*oz.* 3*dwts.* 8*gr.*
9. Add $\frac{4}{5}$ of a Ton to the $\frac{5}{6}$ of a Pound. *Anſ.* 16*cwt.* 0*qrs.* 0*lb.* 13*oz.* $5\frac{1}{3}$*dr.*
10. Add $\frac{1}{6}$ of a Yard to the $\frac{1}{3}$ of a Foot. *Anſ.* 10*in.*
11. Add the $\frac{3}{5}$ of a Pound to the $\frac{3}{8}$ of a Guinea. *Anſ.* 19*s.* $10\frac{1}{2}$*d.*
12. Add $\frac{4}{10}$, $\frac{8}{100}$, $\frac{1}{1000}$, $\frac{2}{10000}$, and $\frac{5}{100000}$ of a Pound into one Sum. *Anſ.* $\frac{48125}{100000}=9$*s.* $7\frac{1}{2}$*d.*

SUBTRACTION of VULGAR FRACTIONS.

Rule. Reduce the given Fractions to a common Denominator, and ſubſtract the leſs Numerator from the greater, and place the Difference over the common Denominator.

When the lower Fraction is greater than the upper, take the Numerator of the lower Fraction from the Denominator, and to that Difference add the upper Nu-

Numerator, carrying one to the Units Place of the lower whole Number.

EXAMPLES.

1. From $\frac{3}{4}$ take $\frac{2}{7}$. *Anſ.* $\frac{13}{28}$.
2. From $\frac{2}{3}$ take $\frac{9}{15}$. *Anſ.* $\frac{1}{15}$.
3. From $\frac{8}{10}$ take $\frac{9}{25}$. *Anſ.* $\frac{11}{25}$.
4. From 15 $\frac{2}{7}$ take $\frac{2}{5}$ of 11 $\frac{1}{3}$. *Anſ.* 10 $\frac{79}{105}$.
5. From $\frac{2}{5}$ of 7 take 1 $\frac{8}{9}$. *Anſ.* $\frac{41}{45}$.
6. From 14 $\frac{1}{4}$ take $\frac{2}{3}$ of 17. *Anſ.* 2 $\frac{11}{12}$.

Note. The following Queſtions muſt firſt be reduced to their proper Quantities by Caſe 11, in Reduction.

7. From the $\frac{3}{5}$ of a Pound take the $\frac{2}{6}$ of a Shilling. *Anſ.* 11*s.* 8*d.*

8. From $\frac{3}{7}$ of a Guinea take $\frac{1}{3}$ of a Pound. *Anſ.* 2*s.* 4*d.*

9. From $\frac{2}{3}$ of a League take $\frac{7}{10}$ of a Mile. *Anſ.* 1*mil.* 2*fur.* 16*pol.*

10. From the $\frac{3}{4}$ of a Pound Troy take $\frac{1}{6}$ of an Ounce. *Anſ.* 8*oz.* 16*dwts.* 16*gr.*

11. From $\frac{4}{5}$ of a Ton take $\frac{5}{6}$ of a Pound. *Anſ.* 15*cwt.* 3*qrs.* 27*lb.* 2*oz.* 10*dr.* $\frac{2}{3}$.

12. From 7 Weeks take 9 Days $\frac{7}{10}$. *Anſ.* 5*wks.* 4*days.* 7*hrs.* 12*min.*

MULTIPLICATION of VULGAR FRACTIONS.

Rule. Prepare the given Numbers (if they require it) by the Rules of Reduction; then multiply the Numerators together for a new Numerator, and the Denominators for a new Denominator.

Note. When any Number, either whole or mixt, is multiplied by a Fraction, the Product will always be leſs than the Multiplicand, in the ſame Proportion as the multiplying Fraction is leſs than an Unit.

EXAMPLES.

1. Multiply $\frac{3}{4}$ by $\frac{6}{7}$. *Anſ.* $\frac{9}{14}$.
2. Multiply $3\frac{7}{9}$ by $\frac{2}{3}$ of $\frac{3}{4}$. *Anſ.* $1\frac{8}{9}$.
3. Multiply $84\frac{1}{8}$ by 7. *Anſ.* $588\frac{7}{8}$.
4. Multiply $\frac{21}{32}$ by $\frac{12}{42}$. *Anſ.* $\frac{252}{1344}=\frac{3}{16}$.
5. Multiply $\frac{9}{10}$ by $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$. *Anſ.* $\frac{3}{8}$.
6. Multiply $9\frac{1}{2}$ by $\frac{2}{6}$. *Anſ.* $3\frac{1}{6}$.
7. Multiply $\frac{3}{4}$ of 9 by $\frac{7}{8}$. *Anſ.* $5\frac{29}{30}$.
8. Multiply 24 by $\frac{2}{3}$. *Anſ.* 16.
9. Multiply $\frac{1}{2}$ of 7 by $\frac{3}{6}$. *Anſ.* $1\frac{9}{2}$.
10. Multiply $51\frac{2}{3}$ by $\frac{6}{7}$ and the Product by 8. *Anſ.* $354\frac{2}{7}$.
11. Multiply 12 by $\frac{1}{2}$. *Anſ.* 6.
12. Multiply $\frac{1}{2}$ of 3 by $\frac{3}{4}$ of 8. *Anſ.* 9.

DIVISON of VULGAR FRACTIONS.

Rule. Prepare the given Numbers (if required) by the Rules of Reduction, multiply the Denominator of the Diviſor, into the Numerator of the Dividend, for a new Numerator, and the Numerator of the Diviſor, into the Denominator of the Dividend, for a new Denominator.

Note. If a whole Number be divided by a Fraction leſs than unity, the Quotient will be greater than the Dividend; but if any Fraction be divided by a whole Number greater than unity, the Quotient will be leſs than the Dividend.

Multiplication and Diviſion prove each other.

EXAMPLES.

1. Divide $\frac{17}{21}$ by $\frac{3}{5}$. *Anſ.* $1\frac{22}{63}$.
2. Divide $\frac{13}{19}$ by $\frac{7}{9}$. *Anſ.* $\frac{117}{138}$.
3. Divide $\frac{14}{18}$ by $\frac{7}{16}$. *Anſ.* $1\frac{14}{126}$.
4. Divide $1\frac{1}{2}$ by $4\frac{8}{10}$. *Anſ.* $\frac{30}{96}$.
5. Divide $\frac{7}{8}$ by 4. *Anſ.* $\frac{7}{32}$.
6. Divide 4 by $\frac{7}{8}$. *Anſ.* $4\frac{4}{7}$.
7. Divide 74 by 116. *Anſ.* $\frac{74}{116}$.
8. Divide $\frac{1}{5}$ of 19 by $\frac{2}{3}$ of $\frac{3}{4}$. *Anſ.* $7\frac{18}{30}$.
9. Divide $\frac{1}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{3}{4}$. *Anſ.* $\frac{34}{36}$.
10. Divide $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$ of $\frac{2}{3}$. *Anſ.* $1\frac{12}{24}$.
11. Divide $4\frac{5}{9}$ by $\frac{5}{9}$ of 4. *Anſ.* $2\frac{1}{20}$.
12. Divide $\frac{5}{9}$ of 4 by $4\frac{5}{9}$. *Anſ.* $\frac{20}{41}$.

The SINGLE RULE of THREE DIRECT in VULGAR FRACTIONS.

THE Operation of the Rule of Three in Fractions, is exactly agreeable to the Principles laid down in the ſame Rule in whole Numbers.

EXAMPLES.

1. If $\frac{4}{5}$ of a lb. of Butter coſt $\frac{7}{9}$ of a Shilling, what coſt $\frac{11}{12}$ of a lb? *Anſ.*

2. If $\frac{3}{5}$ of an Ell coſt $\frac{2}{3}$*l.* what coſt $\frac{12}{17}$ Ell?
Anſ. 15*s.* 8*d.* $\frac{36}{153}$.

3. If $\frac{4}{7}$ of an Ell coſt $\frac{2}{3}$ of a Pound Sterling, what coſt $\frac{12}{17}$ of an Ell? *Anſ.*

4. If 2 $\frac{3}{4}$ Ounces of Silver coſt 15*s.* $\frac{3}{4}$, what is that per *oz.*? *Anſ.*

5. If $\frac{4}{5}$ of an cwt. coſt 5*l.* 16*s.* $\frac{1}{5}$, what muſt be given for 5 $\frac{1}{2}$ cwt.? *Anſ.*

6. If 1 Dollar be worth 56 $\frac{3}{5}$, what are 5000 Dollars worth? *Anſ.* 1179*l.* 3*s.* 4*d.*

7. If $\frac{9}{10}$ of an cwt. coſt 14 $\frac{1}{5}$*l.* what will 7 $\frac{1}{2}$ cwt. coſt at the ſame Rate? *Anſ.* 118*l.* 6*s.* 8*d.*

8. If $\frac{11}{12}$ of an cwt. coſt 19*s.* $\frac{1}{6}$ what coſt 1 $\frac{1}{4}$ cwt.?
Anſ.

9. If 1 Yard of Broad Cloth coſt 15*s.* $\frac{5}{8}$, what will 4 Pieces each containing 27 Yards $\frac{3}{8}$ coſt?
Anſ. 85*l.* 10*s.* 11$\frac{1}{4}$*d.*

10. If 6 $\frac{1}{2}$ Yards coſt $\frac{9}{10}$*l.* what coſt 9$\frac{1}{4}$ yards?
Anſ. 1*l.* 5*s.* 7$\frac{1}{4}$*d.* $\frac{28}{52}$.

11. If $\frac{11}{13}$ lb. of Sugar coſt $\frac{7}{15}$ of a Shilling, what coſt $\frac{32}{43}$ lb.? *Anſ.* 4$\frac{1}{4}$*d.* $\frac{4971}{7895}$.

12. If 1*cwt.* 2*qr.* 16*lb.* 14*oz.* 2 $\frac{7}{8}$*dr.* coſt 1*l.* 1*s.* 5$\frac{2}{17}$*d.* what coſt 3*cwt.* 1*qr.* 5*lb.* 12*oz.* 5*dr.* $\frac{3}{4}$
Anſ. 2*l.* 2*s.* 10 $\frac{4}{17}$*d.*

DECIMAL FRACTIONS.

DECIMAL Fractions are well known to be exceeding uſeful, both in Arithmetic, Menſuration, and many practical Parts of the Mathematics, and is known by having a Dot placed before it thus .5, ſtands for $\frac{5}{10}$ or five tenths, that is, if an Unit; for inſtance, if one Pound be divided into 10 equal Parts, the decimal Expreſſion for 5 of thoſe Parts, or 10

Shillings is .5. Again .57 ſtands for $\frac{57}{100}$, that is, the Integer is ſuppoſed to be divided into 100 equal Parts, and .57 ſtands for 57 of thoſe Parts.

In general, the Value of a Decimal Figure is ten times leſs for every removal from the Dot or Period towards the right Hand, thus, in the Decimal .7777, &c. the 7 immediately after the Dot, is $\frac{7}{10}$, the next is $\frac{7}{100}$, the next is $\frac{7}{1000}$, &c.

6	5	4	3	2	1	.	2	3	4	5	6
C Of Thouſands	X Of Thouſands	Thouſands	Hundreds	Tens	Units		Tenth Parts	Hundredth Parts	Thouſandth Parts	X Thouſandth Parts	C Thouſandth Parts

From which it appears, that as whole Numbers increaſe in a tenfold Proportion to the left Hand, ſo Decimals decreaſe in the ſame Proportion to the right Hand.

ADDITION of DECIMALS.

RULE.

Set down the Numbers to be added directly underneath thoſe of the ſame Value, whether they be mixed Numbers,

bers, or pure Decimals, which is done by paying a proper Regard to the Points as in the following Example.

14	·	75
1	·	46145
7	·	12406
174	·	5
1	·	4
199	·	23551

Add .10074 to .74 to .0056 to 4.678 to 7.41 to 84.656 to .01 to 4.607.

As Addition of Decimals is ſo extremely eaſy, it is unneceſſary to ſhew any great Number of Examples.

SUBTRACTION of DECIMALS.

RULE.

The ſame Care muſt be taken in placing the Numbers as was obſerved in Addition, and the Operation is performed the ſame as in Subtraction of whole Numbers.

EXAMPLE.

From	1.456
Take	1.16543
Rem.	.29057

From .27 take .174
From .5 take .4444

From 1.4 take .9999
From 4. take 2.45607

MULTIPLICATION of DECIMALS.

RULE.

Multiply as in common Multiplication, and cut off as many in the Product, as there are in both Factors taken together.

EXAMPLE.

$$
\begin{array}{lr}
\text{Multiply} & 7.246 \\
\text{By} & 53.4 \\
\hline
 & 28984 \\
 & 21738 \\
 & 36230 \\
\hline
 & 386.9364 \\
\hline
\end{array}
$$

1. Multiply .4541 by 5.4361
2. Multiply .00456 by .10167
3. Multiply .416 by 467.
4. Multiply .0007 by .1714156

Note. When Decimal Places are wanting, ſupply the Defect with Cyphers to the left Hand.

D I-

DIVISION of DECIMALS.

RULE.

Perform the Operation in the ſame Manner as in common Diviſion, and cut off as many Decimals as the Dividend contains more than the Diviſor, that is, if there are 3 places of Decimals in the Diviſor, and 5 in the Dividend, the Difference is 2, which muſt be cut off.

Note 1. If there are as many Decimal Places in the Diviſor as in the Dividend, the Quotient will be a whole Number.

Note 2. If there are not ſo many places of Decimals in the Dividend as in the Diviſor, the Defect muſt be ſupplied with Cyphers.

EXAMPLES.

Divide 386.9364 by 53.4 the Quotient is 7.246.
Divide 9858.66618 by 27.83 *Anſ.* 354.246.
Divide 73.2 by 6.326. *Anſ.* 11.5712.
Divide 1. by 282. and continue the Quotient to ſix Places. *Anſ.* .003546.

Note 3. If there are not ſo many Figures in the Quotient as the Rule requires to be cut off, add Cyphers to the left Hand to ſupply the Defect.

REDUCTION of DECIMALS.

CASE I.

To reduce a Vulgar Fraction to an equivalent Decimal.

Rule. Divide the Numerator by the Denominator, as in Diviſion of Decimals, and the Quotient will be the Decimal required.

1. Reduce $\frac{1}{4}$ of a Pound Sterling to a Decimal.

$$4)\overline{1,00}$$

.25 Anſwer

2. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{5}$, $\frac{5}{6}$, $\frac{7}{8}$, to Decimals.

3. Reduce $\frac{14}{17}$, $\frac{19}{20}$, $\frac{21}{22}$, $\frac{17}{19}$, $\frac{141}{444}$, and $\frac{99}{100}$, to Decimals.

4. Reduce $\frac{5}{19}$, $\frac{4}{21}$, $\frac{71}{192}$, $\frac{144}{159}$, and $\frac{7486}{11111}$, to Decimals.

5. Reduce 7*s*. 6*d*. to the Decimal of a Pound. *Anſ*. .375*l*.

6. Reduce 10*s*. 9¼*d*. to the Decimal of a Pound. *Anſ*. .5385416+

7. Reduce 12 Grains to the Decimal of a Pound Troy. *Anſ*. .002083.

8. Reduce 12 Drams to the Decimal of a Pound Avoirdupois. *Anſ*. .046875.

9. Reduce 2 Quarters 14 Pounds to the Decimal of an cwt. *Anſ*. .625.

10. Reduce 4 Inches to the Decimal of a Yard. *Anſ*. .1111111+

11. Reduce 3 Quarters 2 Nails to the Decimal of a Yard. *Anſ*. .875.

12. Reduce 4 Perches to the Decimal of an Acre. *Anſ.* .025.

13. Reduce 1 Pint to the Decimal of a Gallon. *Anſ.* .125.

14. Reduce 3 Gallons of Wine to the Decimal of a Hogſhead. .047619.

15. Reduce 2 Days to the Decimal of a Week. *Anſ.* .2857142+.

16. Reduce 52 Days to the Decimal of a Year. *Anſ.* .142465+.

C A S E II.

To find the Value of any Decimal Fraction in the known Parts of an Integer.

RULE. Multiply by the Denominative Parts of the Integer, and cut off to the right at each Multiplication as many Figures as the given Decimal contains, and the Figures on the left expreſs the Value.

E X A M P L E S.

1. Required the Value of .39375 of a Pound Sterling.

$$\begin{array}{r} .39375 \\ 20 \\ \hline 7.87500 \\ 12 \\ \hline 10.50000 \\ 4 \\ \hline 2.00000 \end{array}$$

Anſ. 7*s.* 10½*d.*

The given Decimal may be expreſſed $\frac{39375}{100000}$, hence the reaſon of cutting off five Figures, for it is in effect to divide by 100000.

2. Required the Value of .4875 of a Pound ?
Anſ. 9*s.* 9*d.*

3. Required the Value of .75 of a Pound ?
Anſ. 15*s.*

4. Required the Value of .00625 of a Pound ?
Anſ. 1½*d.*

5. How many Pence and Farthings are in .375 of a Shilling ? *Anſ.* 4½*d.*

6. How many Farthings are in .75 of a Penny ?
Anſ. ¾*qr.*

7. Required the Value of .4375 of a Guinea ?
Anſ. 9*s.* 2¼*d.*

8. Required the Value of .46875 of a Tun.
Anſ. 9*cwt.* 1*qr.* 14*lb.*

9. What is the Value of .625 of a Gallon ?
Anſ. 2*qrts.* and 1*pt.*

10. What is the Value of .071428 of a Hogſhead of Wine ? *Anſ.* 4*gal.* 1*qrt.* and .999856 remains

11. How many Roods and Poles are in .7354 of an Acre ? *Anſ.* 2*rds.* 37*po.* and .664 remains.

12. How many Days are in .575 of a Year ?
Anſ. 209, and .875 of a Day.

The RULE of THREE in DECIMALS.

1. IF 1.25 Pound of Tea coſt .4166*l.* what coſt 35.125 Pound ?
Anſ. 11*l.* 4*s.* 1½*d.* 2016 remains.

2. What will the Pay of 540 Men come to at 1*l.* 5*s.*5. per Man ? *Anſ.* 688.5*l.*

3. If 7.75 Yards of Cloth coſt 2*l.* 12.75*s.* what will 140.5 Yards coſt? *Anſ.* 47*l.* 16*s.* 3.6*d.*

4. If a Cheſt of Sugar, weighing 7 Hundred weight, 2 Quarters, 14 Pound, coſt 36*l.* 12.75*s.* what will 2 Hundred weight, 1 Quarter 21 Pounds come to at the ſame Rate? *Anſ.* 11*l.* 14*s.* 2*d.* 3.5*qrs.*

5. If 1 Pint of Wine coſt 1.2*s.* what coſt 12.5 Hogſheads? *Anſ.* 378*l.*

6. What will 326.25 Pound of Tobacco come to when 1.5 Pound is ſold for 3.5*s.*

Anſ. 38*l.* 1*s.* 3*d.*

7. If 1 Yard of Cloth coſt 12.3*s.* what coſt 3 Pieces, each 21.5 Yards? *Anſ.* 39*l.* 13*s.* 4.2*d.*

8. A Man bought a Piece of Cloth for 6*l.* 13.12*s.* I demand how many Yards it contained when he gave after the Rate of 4*s.* 2.9*d.* for one Yard?

Anſ. 31.3836*yds.*

9. If 2 Ounces of Silver coſt 11*s.* what is the Price of a Tankard that weighs 1lb. 10*oz.* 10*dwt.* 4*gr.*?

Anſ. 6*l.* 3*s.* 9*d.* 2.2*qrs.*

10. If 1lb. of Tobacco coſt 1.25*s.* what coſt 3 Hogſheads, weighing together 15*cwt.* 1*qr.* 19*lb.*?

Anſ. 107*l.* 18*s.* 9*d.*

11. If I gave 1*s.* 1*d.* for 3.5*lb.* of Cheeſe, what coſt 112*lb.*? *Anſ.* 1*l.* 14*s.* 8*d.*

12. Bought 29.25*lb.* of Coffee for 10*l.* 11.25*s.* what is the Value of 15*lb.*? *Anſ.* 10*s.* 10*d.*

13. If 1.2*lb.* coſt 10.4 of a Shilling, what coſt 144.9*lb.*? *Anſ.*

14. If 21 Gallons of Rum coſt 10.2*l.* what coſt 1.5 Gallons? *Anſ.*

15. If 74.4 Yards of Cloth coſt 49.9*l.* what coſt one Engliſh Ell? *Anſ.*

16. If 17.7 Ells coſt 16.5*l.* what coſt 3.27 Ells?

Anſ.

SIM-

SIMPLE INTEREST.

WHEN Money is lent, that Premium or Reward which is given for the Loan of it, is called Intereſt.

Simple Intereſt is, when the Intereſt is received as it becomes due; or when allowed to remain in the Borrowers Hands without paying for it.

The Sum lent is the Principal; the Rate is the Intereſt of 100*l.* for one Year. The Amount is the Sum of the Principal and Intereſt.

CASE I.

Given the Principal Rate and Time to find the Intereſt.

Rule. As 100*l.* is to the Rate per Cent. for one Year, ſo is the Principal to the Intereſt for one Year; which multiplied by the Time, produces the Intereſt.

Or multiply the principal Rate and Time, and divide their Product by 100, which is done by cutting off two Figures in the Product.

EXAMPLES.

What is the Intereſt of 750*l.* at 5 per Cent. for 8 Years.

RULE I.

As 100*l.* . . 5*l.* : : 750*l.* . . 37*l.* 5*s*, which multiplied by 8, give the Anſwer.

RULE

RULE II.

$$\frac{750\times 5\times 8}{100}=300l.$$ The Anſwer.

2. Required the Intereſt of 655*l.* for 3 Years at 4 per Cent. per Annum. *Anſ.* 78.6=78*l.* 12*s.*

3. What is the Intereſt of 110*l.* for 2 Years at 4 per Cent. per Annum? *Anſ.* 8*l.* 16*s.*

4. What is the Intereſt of 76*l.* for 4 Years at 5 per Cent. per Annum? *Anſ.* 15*l.* 4*s.*

5. What is the Amount of 400*l.* for 12 Years at 6 per Cent. per Annum? *Anſ.* 688*l.*

6. If 100*l.* in one Year gives 5*l.* Intereſt, what will 486*l.* yield in 5 Years? *Anſ.* 121*l.* 10*s.*

COMMISSION.

COMMISSION is an Allowance from Merchants to their Factors or Agents in the buying or ſelling of any ſort of Goods; and is a certain Rate per Cent. according to the Cuſtom of the Country where the Factor reſides.

EXAMPLES.

My Factor ſends me word that he has bought Goods to the Value of 500*l.* 13*s.* 6*d.* upon my Account; I demand his Commiſſion at 3½ per Cent.?

Anſ. 17*l.* 10*s.* 5½*d.* $\frac{68}{100}$.

My Correſpondent has diſburſed on my Acconnt, the Sum of 1009*l.* 18*s.* what is his Commiſſion at 2¼ per Cent.? *Anſ.* 22*l.* 14*s.* 5*d.* 1*qr.* $\frac{84}{100}$.

Suppoſe I allow my Correſpondent 1¾ per Cent. for Proviſion, what may he demand on the Diſburſement of 704*l.* 15*s.* 4*d.* *Anſ.* 12*l.* 6*s.* 8*d.* $\frac{2}{100}$.

CASE II.

When the Time conſiſts of ¼, ½, or ¾.

Rule. Multiply the Intereſt of one Year by the Number of Years, and take Parts for ¼, ½, &c. add them together, and you have the Anſwer.

EXAMPLES.

1. What is the Intereſt of 200*l.* for 3½. Years at 5 per Cent. per Annum?

```
   200     | ½ | ½ | 10
     5     |   |   |  3
  -----    |   |   | ----
 10 | 00   |   |   | 30
           |   |   |  5
           |   |   | -----
           |   |   | 35  Pounds the Anſwer.
```

2. What is the Intereſt of 464*l.* 16*s.* 6½*d.* for 1 Year and ¾, at 6 per Cent. per Annum.
Anſ.

3. What is the Intereſt of 70*l.* 14*s.* 6*d.* for 2 and ½ Years at 4 per Cent. per Annum? *Anſ.*

4. What is the Amount of 468*l.* 12*s.* 4*d.* for 1 Year and $\frac{3}{4}$ at 6 per Cent. per Annum? *Anſ.* 517*l.* 16*s.* 5*d.*

5. What is the Intereſt of 1000*l.* for 2 Years and $\frac{3}{4}$, at 4 per Cent. per Annum? *Anſ.* 110*l.*

B R O K A G E

IS an Allowance made to Perſons called Brokers, at a certain Rate per Cent. for finding Cuſtomers, and ſelling to them the Goods of other Men.

RULE. Divide the given Sum by 100, and take Parts from the Quotient for the Rate per Cent.

E X A M P L E S.

What is the Brokage of 649*l.* at 4 Shillings per Cent.?

```
6 | 49     | s. |     |
  | 20     | 4  | 1/5 | 6   9   9½
  | ---    |    |     | -----------
9 | 80     |    |     | 1   5  11½   Anſwer
  | 12
  | ---
9 | 60
  |  4
  | ---
2 | 40
```

What may a Broker demand for Brokage when he ſells Goods to the Value of 500*l.* 10*s.* 7½*d.*

Anſ.

What may a Broker demand who ſells Goods to the Value of 749*l.* 19*s.* *Anſ.*

Note. If the Brokage ſhould be one or more per Cent. the Operation will be the ſame with that in Factors Allowances.

CASE III.

When the Rate per Cent. is $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ more than the Pounds given in the ſaid Rate.

Rule. Multiply the Principal by the Pounds, and take Parts for the $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, add them together, and proceed as before.

EXAMPLES.

1. What is the Intereſt of 400*l.* for 2 Years at 5$\frac{1}{2}$ per Cent. per Annum? *Anſ.* 44*l.*
2. What is the Intereſt of 120*l.* for one Year at 4$\frac{1}{2}$ per Cent. per Annum? *Anſ.* 5*l.* 8*s.*
3. What is the Amount of 690*l.* for 3 Years, at 4$\frac{1}{4}$ per Cent. per Annum? *Anſ.* 777*l.* 19*s.* 6*d.*
4. What is the Amount of 479*l.* 16*s.* 9*d.* for 5 Years and $\frac{1}{4}$, at 4$\frac{3}{4}$ per Cent. per Annum? *Anſ.*

CASE IV.

To find the Intereſt of any Sum for a certain Number of Weeks, ſay as 52 Weeks are to the Intereſt of the given Sum for a Year; ſo are the Weeks given to the Intereſt required.

1. What is the Intereſt of 120*l.* for 5 Weeks at 5 per Cent. per Annum? *Anſ.*

2. What is the Intereſt of 174*l.* 10*s.* for 51 Weeks at $4\frac{3}{4}$ per Cent. per Annum?

3. What is the Amount of 500*l.* for 4 Weeks at 5 per Cent. per Annum?

CASE V.

To find the Intereſt for any Number of Days ſay.

As 365 Days are to the Intereſt of the given Sum for a Year; ſo are the Days given to the Intereſt required.

EXAMPLES.

1. What is the Intereſt of 400*l.* 10*s.* 6*d.* for 20 Days at 5 per Cent. per Annum. *Anſ.*

2. What is the Intereſt of 126*l.* for 145 Days at 6 per Cent. per Annum? *Anſ.* 3*l.* 0*s.* 0*d.* 3*qrs.* $\frac{57}{365}$.

3. What is the Intereſt of 100*l.* for 34 Days at $4\frac{1}{2}$ per Cent. per Annum? *Anſ.*

4. What is the Amount of 34*l.* 10*s.* for 44 Days at $4\frac{7}{8}$ per Cent. per Annum? *Anſ.*

5. What is the Amount of 46*l.* for 30 Days at $4\frac{9}{10}$ per Cent. per Annum? *Anſ.*

CASE VI.

Given the Amount, Time and Rate per Cent. to find the Principal.

Rule. As the Amount of 100*l.* at the Rate and Time given, is to 100*l.* ſo is the Amount given, to the Principal required.

EXAMPLES.

1. What Principal will Amount to 750*l.* in 2 Years at 4 per Cent. per Annum? *Anſ.* 694*l.* 8*s.* 10*d.* $\frac{2}{3}$.

2. What Principal being put to Intereſt for 7 Years, will amount to 793*l.* 12*s.* at 4 per Cent. per Annum? *Anſ.* 620*l.*

CASE VII.

Given the Amount, Time and Principal to find the Rate per Cent.

Rule. As the Principal is to the Intereſt for the whole Time; ſo is 100*l.* to its Intereſt for the ſame Time. Divide the Intereſt laſt found by the Time, and the Quotient will be the Rate per Cent.

EXAMPLES.

1. At what Rate per Cent. will 500*l.* amount to 725*l.* in 9 Years. *Anſ.* 5 per Cent.

2. At what Rate per Cent. will 420*l.* Amount to 520*l.* 16*s.* in 8 Years? *Anſ.* 3 per Cent.

CASE VIII.

Given the Principal, Amount, and Rate per Cent. to find the Time.

Rule. As the Intereſt of the Principal for one Year at the given Rate is to one Year; ſo is the whole Intereſt to the Time required.

1. In what Time will 500*l.* amount to 725*l.* at 5 per Cent. per Annum? *Anſ.* 9 Years.

2. In what Time will 420*l.* amount to 520*l.* 16*s.* at 3 per Cent. per Annum? *Anſ.* 8 Years.

COMPOUND INTEREST.

COMPOUND INTEREST is that which ariſes, from the Intereſt being added to the Principal; and, continued in the Hands of the Borrower, becomes a Part of the Principal at the End of each ſtated Time of Payment.

Rule. Find the Amount of the given Principal for the Time of the firſt Payment, by Simple Intereſt; next find the Intereſt of that Sum or Principal, and add it as before; and thus proceed for any Number of Years, &c. The given Principal being ſubtracted from the laſt Amount, the Remainder will be the Compound Intereſt. Or, find the Amount of 1 Pound for the Time of the firſt Payment, and multiply it by itſelf, as often as there are Times of Payment, leſs by one; that is, twice by itſelf if there be three Payments, thrice if there be four, &c.—this laſt Product and the Principal multiplied together, the Product will be the whole Amount: Or, ſeek in the following Table for the Amount of 1 Pound at the Rate and Time given, which being multiplied into the Principal, the Product will be the Amount, that is, the Compound Intereſt and Principal together.

N. B. The Times of Payments, whether yearly, monthly, &c. muſt be equal.

The following Tables ſhew the Amount of one Pound, at the Rates of 3½, 4, 5, and 6*l.* per Cent. per Annum, from 1 Year to 20.

1. A Table of the Amount of 1*l.* at 3½*l.* and 4*l.* per Cent.

	3½ RATES. 4.			3½ RATES. 4.	
years.	*l. dec. prts.*	*l. dec. prts.*	*years.*	*l dec. prts.*	*l. dec. prts.*
1	1,035	1,04	11	1,45996	1,53945
2	1,07122	1,0816	12	1,51106	1,60103
3	1,10871	1,12486	13	1,56395	1,66507
4	1,14752	1,16986	14	1,61068	1,73167
5	1,18768	1,21665	15	1,67533	1,70094
6	1,22925	1,26531	16	1,73397	1,87298
7	1,27227	1,31593	17	1,79466	1,94790
8	1,31681	1,36856	18	1,85747	2,02581
9	1,36289	1,42331	19	1,92248	2,10684
10	1,41059	1,48024	20	1,98977	2,19112

2. A Table of the Amount of 1*l.* at 5*l.* and 6*l.* per Cent.

	5. RATES. 6.			5. RATES. 6.	
years.	*l. dec. prts.*	*l. dec. prts*	*years.*	*l. dec. prts.*	*l. dec. prts.*
1	1,05	1,06	11	1,71033	1,89829
2	1,1025	1,1236	12	1,79585	2,01219
3	1,15762	1,19101	13	1,88564	2,13292
4	1,2155	1,26247	14	1,97993	2,2609
5	1,27628	1,33822	15	2,07892	2,39655
6	1,34009	1,41851	16	2,18287	2,54053
7	1,4071	1,50363	17	2,29201	2,69277
8	1,47745	1,59384	18	2,40661	2,85433
9	1,55132	1,68947	19	2,52695	3,02559
10	1,62889	1,79084	20	2,65329	3,20713

N. B. In

N. B. In finding the Amount of 1*l.* for 1 Year, at the above Rates per Cent. the following Proportions were uſed, viz.

l. *l.* *l.* *l.* *l.* *l.* *l.* *l.*
As 100 : 103,5 : : 1 : 1,035 As 100 : 104 : : 1 : 1,04
As 100 : 105 : : 1 : 1,05 As 100 : 106 : : 1 : 1,06

EXAMPLES.

1. What will the Compound Intereſt of 370*l.* Amount to in 6 Years, at 4*l.* per Cent. per Annum?
Anſ. 98*l.* 3*s.* 4¼*d.*

2. What will 50*l.* amount to in 1 Year, at 5*l.* per Cent. per Annum, payable every 2 Months?
Anſ. 52*l.* 11*s.* 0¼ +

3. What will 200*l.* amount to in 5 Years, at 4*l.* per Cent. per Annum, Compound Intereſt?
Anſ. 243*l.* 6*s.* 7¼ +

REBATE OR DISCOUNT.

THE Rebate or Diſcount of any Sum of Money, is the Difference between its preſent Value, and that due at any time to come.

The preſent Value of 50*l.* due ſix Months hence, calculated at 5*l.* per Cent. per Annum, is only 48*l.* 15*s.* 7¼*d.* becauſe if 48*l.* 15*s.* 7¼*d.* were to be placed out at Intereſt for 6 Months, at 5*l.* per Cent. per Annum, its Amount would then be 50*l.*

RULE. As the Amount of 100*l.* for the given Rate and Time, is to 100*l.* or the Intereſt of 100*l.* for the given Time; ſo is the given Sum or Debt, to the preſent Worth, or Diſcount of the given Sum.

EXAMPLES.

1. What is the preſent Value of 40*l.* due 2 Months hence, Diſcount at 5*l.* per Cent. per Annum?

Anſ. 39*l.* 13*s.* $4\frac{1}{2}$ $\frac{156}{242}$.

	m.		*l.*	*s.*	*d.*	
	2	$\frac{1}{6}$	5	0	0	The Intereſt of 100*l.* for 1 Year.
			0	16	8	Ditto of 100*l.* for 2 Months.
Add			100	0	0	
The ſum is			100	16	8	The Amount of 100*l.* at the given Rate and Time.

The Sum given is 40*l.* Then, by the Rule, the ſtating will be as follows:

As 100*l.* 16*s.* 8*d.* : 100*l.* : : 40*l.* : the preſent Value.

Anſ. 39*l.* : 13 : $4\frac{1}{2}$ $\frac{156}{242}$.

2. What is the preſent Value of 271*l.* 10*s.* 6*d.* for 7 Months, at $4\frac{1}{2}$ per Cent. per Annum?

Anſ. 264*l.* 11*s.* 7*d.* $\frac{363}{2463}$.

3. How much preſent Money will pay a Debt of 761*l.* 5*s.* due 1 Year hence, 5 per Cent. being allowed for preſent Payment. *Anſ.* 725*l.*

4. A Legacy of 7000*l.* is to be paid in 2 Years, but the Perſon to whom it is left, agrees to ſell it for ready Money, allowing $4\frac{1}{2}$ per Cent. Diſcount, how much muſt he receive at preſent? *Anſ.* 6422*l.* 0*s.* 4*d.* $\frac{44}{109}$.

5. How much preſent Money will pay a Bill of 300*l.* due in 3 Months, at 5 per Cent.?

Anſ. 296*l.* 5*s.* 11*d.*

EQUATION OF PAYMENTS.

WHEN Sums are due at different Periods, the Time for the Payment of the Whole is determined by Equation of Payments.

COMMON WAY.

Multiply each Sum by the Time of its becoming payable, and divide the Amount of theſe Products by the Sum of the Payments.

The TRUE WAY.

Find the Value of each Payment for its reſpective Time as in Rebate. Compute in what Time the Sum of theſe preſent Values will amount to the Total of the Payments.

EXAMPLES.

1. A. has 200*l.* to pay in 4 Months; 600*l.* in 6 Months; and 400*l.* in 9 Months. But he chuſes to pay the Whole at once. When muſt that be?

$4 \times 200 = 800$
$6 \times 600 = 3600$
$9 \times 400 = 3600$

1200)8000

$6\frac{2}{3}$ Months.

2. In 2 Months 72*l.* is due; in 8 Months 24*l.*; and 60*l.* in 12 Months. If the Whole be paid together, in what Time muſt the Payment be made.

Anſ. $6\frac{10}{13}$ Months.

ANNUITIES at SIMPLE INTEREST.

TO find the Amount of any Annuity, or yearly Sum.

Rule. Multiply the Intereſt of 1*l.* in 1 Year, by the Annuity, and the Product by the Number of Years leſs 1. Add twice the Annuity to the laſt Product, and multiply the Sum, by Half the Number of Years.

EXAMPLES.

1. Required the Amount of an Annuity of 80*l.* forborn 6 Years, at 5 per Cent. Simple Intereſt?

.05	Intereſt of 1*l.* in 1 Year
80	Annuity
4.00	
5	Number of Years leſs 1
20	
160	Twice the Annuity
180	
3	Half Number of Years
540	Pounds the Amount.

2. Required the Amount of an Annuity of 72*l.* 10*s.* forborn 7 Years, at 4½ per Cent. Simple Intereſt?

Anſ. 618*l.* 0*s.* 3*d.*

ANNUITIES at COMPOUND INTEREST.

CASE I.

To find the Amount of any Annuity at Compound Intereſt.

Rule. Multiply the Amount of 1*l.* in 1 Year, as often into itſelf, as there are Years. Subtract 1 from the laſt Product. Divide the Remainder by the Intereſt of 1*l.* in 1 Year; and multiply the Quotient by the Annuity.

EXAMPLES.

1. Required the Amount of an Annuity of 50*l.* in 4 Years at 5 per Cent. Compound Intereſt?

The Amount of 1*l.* in 1 Year at 5 per Cent. is 1.05.

The Intereſt of 1*l.* in 1 Year is .05.

$$1.05\times 1.05\times 1.05\times 1.05=1.21550625.$$

$$\frac{1.21550625-1.}{.05}\times 50=215.50625l.=215l.\ 10s.\ 1\tfrac{1}{2}d.$$

2. What is the Amount of an Annuity of 240*l.* in 6 Years at 4 per Cent. *Anſ.* 1591*l.* 18*s.* 3¼*d.*

3. What is the Amount of an Annuity of 20*l.* in 8 Years at 4½ per Cent? *Anſ.* 187*l.* 12*s.*

It is eaſy to conceive, that by this Rule, Tables may be computed to ſhew the Amount of 1*l.* at any Rate, for any Number of Years. The Amount of 1*l.* multiplied by the Annuity, will readily give the Amount of the Annuity.

A Table ſhewing the Amount of 1*l.* Annuity at 5 per Cent. as far as 21 Years. Compound Intereſt.

Years.	*Amount.*	*Years.*	*Amount.*	*Years.*	*Amount.*
1	1.000000	8	9·549109	15	21·578564
2	2.05	9	11.026564	16	23·657491
3	3·1525	10	12·577892	17	25·840366
4	4·310125	11	14·206787	18	28.132384
5	5·525631	12	15·917126	19	30·539003
6	6.801913	13	17·712982	20	33·065954
7	8.142008	14	19·598632	21	35·719252

EXAMPLES by the TABLE.

1. Required the Amount of an Annuity of 200*l.* forborn 16 Years at 5 per Cent. Compound Intereſt?

23·657491 × 200 = 4731·4982 = 4731*l.* 9*s.* 11½*d.*

2. Required the Amount of an Annuity of 60*l.* 5*s.* in 10 Years, at 5 per. Cent.? *Anſ.* 757*l.* 16*s.* 4¼*d.*

CASE II.

To find the preſent Worth of an Annuity which has to continue a given time, Compound Intereſt being allowed for purchaſe Money.

Rule. Multiply the Amount of 1*l.* in 1 Year, as often by itſelf as there are Years; and divide the Annuity by the Product. Subtract the Quotient from the Annuity; and divide the Remainder by the Intereſt of 1*l.* in 1 Year.

E X A M P L E S.

1. What is the preſent Worth of an Annuity of 50*l.* to continue 6 Years at 5 per Cent. Compound Intereſt?

1.05 multiplied 6 Times by itſelf, produces 1.3400956+

1.3400956) 50. (37·31077

$$\frac{50-37\cdot31077}{.05}=253\cdot7846l.=253l.\ 15s.\ 8\tfrac{1}{4}d.$$

2. A Perſon has an Annuity of 60*l.* certain for 4 Years, which he would ſell at preſent, and allow the Purchaſer 5 per Cent. Compound Intereſt; what Sum muſt be given for it? *Anſ.* 212*l.* 15*s.* 1½*d.*

But the preſent Worth of any Annuity is much more readily found by Tables that contain the preſent Worth of 1*l.* Annuity, computed by the above Rule.

A Table containing the preſent Worth of 1*l.* Annuity as far as 21 Years at 5 per Cent. Compound Intereſt.

Years.	*Pt. Worth.*	*Years.*	*Pt. Worth.*	*Years.*	*Pt. Worth.*
1	.952381	8	6.463213	15	10.379658
2	1.859410	9	7.107821	16	10.837770
3	2.723248	10	7.721735	17	11.274066
4	3.545950	11	8.306414	18	11.689587
5	4.329476	12	8.863251	19	12.085321
6	5.075692	13	9.393573	20	12.462210
7	5.786373	14	9.898641	21	12.821153

EXAMPLES by the TABLE.

1. What is the preſent Worth of an Annuity of 32*l.* at 5 per Cent. to continue 20 Years?

12.462210 × 32 = 398.79072 = 398*l.* 15*s.* 9¾*d.*

2. What is the preſent Worth of an Annuity of 100*l.* at 5 per Cent. to continue 9 Years?

Anſ. 710*l.* 15*s.* 7½*d.*

When the Annuity is payable half yearly, the Amount of 1*l.* for half a Year, muſt be multiplied twice as often by itſelf, as there are Years, and half the Annuity muſt be uſed inſtead of the Whole. In quarterly Payments, the Amount of 1*l.* in one Quarter muſt be multiplied four Times as often as there are Years, and one-fourth of the Annuity muſt be taken.

1. What is the preſent Worth of an Annuity of 100*l.* payable half yearly, for 4 Years at 5 per Cent?

Anſ. 358*l.* 10*s.* 1½*d.*

2. What is the preſent Worth of an Annuity of 80*l.* payable quarterly for 3 Years, at 4 per Cent?

Anſ. 225*l.* 2*s.* 0½*d.*

CASE III.

To find the preſent Worth of a Reverſionary Annuity, that is, of one which does not commence until a future Period.

Rule. Find the Value of the Annuity according to the Time and Rate, by Caſe II. without any regard to the Time of its Commencement, and call it A.

Multiply the Amount of 1*l.* in 1 Year, as often by itſelf as there are Years before the Commencement of the Annuity, and divide the Value A. by the Product.

E X A M P L E S.

1. What is the preſent Worth of an Annuity of 30*l.* to continue 4 Years, but not to commence until the End of 3 Years from the Time of paying the purchaſe Money?

By the preſent Worth Table $3.54595 \times 30 = 106.3785 = A$, the Value of the Annuity at the Time of commencing. Then

$$\frac{106.3785}{1.05 \times 1.05 \times 1.05} = 91.8937l. = 91l.$$

17*s.* 10½*d.*

2. What Sum muſt be given for an Annuity of 120*l.* to continue 6 Years, at 4 per Cent. but not to commence until the End of 3 Years? *Anſ.* 559*l.* 4*s.* 6¾*d.*

C A S E IV.

To find the Value of a Freehold Eſtate, or Annuity to continue for ever.

Rule. Divide 100 Times the Annual Value, by the Rate.

E X A M P L E S.

1. What Sum muſt be given for an Eſtate of 2000*l.* per Annum at 5 per Cent. Compound Intereſt?

$$\frac{2000 \times 100}{5} = 40000l.$$

2. Required the preſent Worth of an Eſtate of 325*l.* 12*s.* 6*d.* per Annum at 4 per Cent.?

Anſ. 8140*l.* 12*s.* 6*d.*

3. A Gentleman in 4 Years will be in Poſſeſſion of an Eſtate of 600*l.* per Annum; what is it worth at preſent at 5 per Cent.? *Anſ.* 9872*l.* 8*s.* 5¾*d.*

CASE V.

To find the preſent Worth of a Life Annuity.

Rule. Multiply the Annuity by the Number againſt the Age, in the following Table.

Age.	*At 5 per Cent.*	*Age.*	*At 5 per Cent.*	*Age.*	*At 5 per Cent.*	*Age.*	*At 5 per Cent.*
6	14.1	24	12.4	42	10.1	60	7.9
8	14.3	26	12.1	44	9.9	62	7.6
10	14.3	28	11.8	46	9.7	64	7.3
12	14.2	30	11.6	48	9.4	66	6.9
14	14.0	32	11.3	50	9.2	68	6.6
16	13.7	34	11.0	52	8.9	70	6.2
18	13.4	36	10.8	54	8.6	72	5.8
20	13.0	38	10.5	56	8.4	74	5.4
22	12.7	40	10.3	58	8.1	75	5.2

EXAMPLES.

1. A Gentleman aged 42, has an Annuity of 120*l.* which he would ſell, and allow the Purchaſer 5 per Cent. Compound Intereſt, how much muſt be given for it?

120 × 10.1 = 1212*l.*

2. Required the preſent Worth of an Annuity of 50*l.* at 5 per Cent. belonging to a Perſon of 29 Years. *Anſ.* 585*l.*

If the Sum to be laid out, and the Age be given, divide the Sum by the tabular Number, and the Quotient is the Annuity.

EXAMPLES.

1. A Perſon aged 36, wiſhes to lay out 1000*l.* for an Annuity, how much will it procure at 5 per Cent.?

$$\frac{100}{10.8}=92\cdot59259=92l.\ 11s.\ 10\tfrac{1}{4}d.$$

2. What Annuity will 600*l.* purchaſe at 5 per Cent. to a Perſon of 56 Years of Age? *Anſ.* 714*l.* 5*s.* 8½*d.*

SINGLE FELLOWSHIP.

SINGLE Fellowſhip is when the ſeveral Sums put in by the Partners are all continued the ſame time. It may be performed three Ways.

RULE 1. As the whole Stock : the Gain or Loſs :: Any Share : the Gain or Loſs belonging to it.

RULE. Divide the Gain or Loſs by the Stock, and multiply the Quotient into each Share.

RULE 3. Divide the Stock by the Gain and Loſs, and divide each Share by the Quotient.

EXAMPLES.

1. A. B. and C. Trade in Company. A. put in 640*l.* B. 960*l.* and C. 1024*l.* The Gain was 656*l.* Required the Gain for each?

$$\begin{array}{r l} 640 & \\ 960 & \\ 1024 & \\ \hline 2624 & \text{Stock} \\ \hline \end{array}$$

By Rule 1.

As 2624 : 656 :: 640 : 160*l.* A's Gain.
As 2624 : 656 :: 960 : 240*l.* B's Gain.
As 2624 : 656 :: 1024 : 256*l.* C's Gain.

By Rule 2. $\frac{656}{2624} = .25$, then $640 \times .25 = 160$*l.* A's Gain; $960 \times .25 = 240$*l.* B's Gain; and $1024 \times .25 = 256$*l.* C's Gain.

By Rule 3. $\frac{2624}{656} = 4$; then $640 \div 4 = 160$*l.*; 960*l.* $\div 4 = 240$*l.*; and $1024 \div 4 = 256$*l.*

2. A, B, and C Trade in Company; A put in 28*l.* 12*s.* B 44*l.* 8*s.* and C 50*l.* 12*s.* They Gain 36*l.* 1*s.* how much Gain for each?

Anſ. A 8*l.* 6*s.* 10*d.*; B 12*l.* 9*s.* and C 14*l.* 15*s.* 2*d.*

3. A Bankrupt owes to A 164*l.* 12*s.* to B 960*l.* 16*s.* and to C 2402*l.* 8*s.* His Eſtate is 1332*l.* 18*s.* 6*d.* how much will each Creditor receive?

Anſ. A 61*l.* 14*s.* 6*d.* B 360*l.* 6*s.* and C 900*l.* 18*s.*

4. A, B, C, and D have 24*l.* to pay in Proportion to their Rents. The Rent of A is 248*l.*; B 132*l*; C 310*l.* and D 390*l.*; how much muſt each pay?

Anſ. A 5*l.* 10*s.* 2$\frac{2}{3}$*d.* B 2*l.* 18*s.* 8*d.* C 6*l.* 17*s.* 9$\frac{1}{3}$*d.* and D 8*l.* 13*s.* 4*d.*

COMPOUND FELLOWSHIP.

IF both the Sums, and the Time of employing them be different, it is Compound Fellowſhip.

Rule. Multiply each Sum by its Time, and with the Products as Shares, and the Gain, proceed by any of the three Rules in Single Fellowſhip.

EXAMPLES.

1. A, B, and C trade in Company. A had 60*l.* in trade 10 Months; B 100*l.* 8 Months, and C 180*l.* in 6 Months. They gain 124*l.*; how much is the Gain for each? *Anſ.* A 30*l.* B 40*l.* and C 54*l.*

2. A and B each put in 80*l.* In 4 Months A put in 100*l.* more, and 2 Months after that B put in 180*l.* more. They traded together in all 12 Months, at

the End whereof their whole Stock was 570*l.* how much of it belongs to each of them?

Anſ. To A 264*l.* and to B 306*l.*

ALLIGATION MEDIAL.

ALLIGATION Medial, is when Goods are mixed, and the Value of 1 of the Quantity after the mixture is wanted.

Rule. Find the Value of each Quantity mixed, and then divide the whole Value by the whole Quantity.

EXAMPLES.

1. If 40 Gallons of Wine at 8*s.* be mixed with 60 Gallons at 12*s.* how much will 1 Gallon of the Mixture come to?

40 Gallons at 8*s.* = 320

60 Gallons at 12*s.* = 720

100 — 1040

Then $\frac{1040}{100}$ = 10*s.* 4$\frac{4}{5}$*d.*

2. A Perſon mixes 120 Pounds of Tea at 8*s.*; 90 Pounds at 7*s.* 6*d.* and 180 Pounds at 6*s.* Required the Price of 1 Pound of the Mixture? *Anſ.* 6*s.* 11$\frac{7}{13}$*d.*

ALLIGATION ALTERNATE.

THIS is when the Prices and Compoſition are given, to find the ſeveral Parts.

RULE. Bring all the Prices into one Denomination. Link a greater Price than the Mean, to one leſſer than the Mean, until all the Prices are linked. Find the Differences between theſe Prices and the Mean, which place alternately.

As the Sum of theſe Differences : the Compoſition :: any particular Difference : the Number at the Price, oppoſite to that Difference.

E X A M P L E S.

1. What Number of Gallons at 10*s.* at 9*s.* 6*d.* at 8*s.* 4*d.* and at 6*s.* 8*d.* will conſtitute a Mixture of 162 Gallons at 9*s.* 4*d.* per Gallon?

$$112 \left| \begin{array}{rr} 120 & 32 \\ 114 & 12 \\ 100 & 2 \\ 80 & 8 \\ \hline & 54 \end{array} \right.$$

As 54 : 162 : : 32 : 96 Gallons at 10*s.*
54 : 162 : : 12 : 36 - - - at 9*s.* 6*d.*
54 : 162 : : 2 : 6 - - - at 8*s.* 4*d.*
54 : 162 : : 8 : 24 - - - at 6*s.* 8*d.*

2. How many Pounds at 6*s.* 8*d.* at 5*s.* 4*d.* at 4*s.* 6*d.* and at 4*s.* will make a Mixture of 330 Pounds at 4*s.* 8*d.* per Pound?

Anſ. 44*lb.* 11*lb.* 11*lb.* 132*lb.* and 132*lb.*

B A R T E R.

WHEN Goods of one Kind are exchanged for Goods of another, they are ſaid to be bartered.

Rule. Multiply the given Quantity by the Price of it, and divide the Product by the Price of the Quantity required.

E X A M P L E S.

1. How many Yards of Muſlin at 9*s.* 10*d.* per Yard, muſt be given for 472 Yards of Cotton at 8*s.* 8*d.* per Yard?

$$\frac{472\times 32}{118} = 128 \text{ Yards of Muſlin.}$$

2. How many Gallons of Wine, at 9*s.* 6*d.* per Gallon, muſt be given for 3 Hundred 2 Quarters 14 Pound of Tea, at 7*s.* 6*d.* per Pound? *Anſ.* 320 $\frac{10}{19}$ Gallons.

3. Two Men C and D Barter, C gives D 640 Gallons of Wine, at 6*s.* 8*d.* per Gallon, for which D gives C 512 Yards of Silk; what is the Value of 1 Yard of Silk?

4. A gives B 5 Hundred 2 Quarters 10 Pound of Rice, at 3½*d.* per Pound; one third of which is to be paid in ready Money, and the Remainder in Linen at 2*s.* 8½*d* per Yard, how much Linen muſt B give A?

Anſ. 44*yds.* 3*qr.* 3 $\frac{19}{195}$*n.*

5. L and M barter, L has Linen at 1*s.* 9½*d.* per Yard, but in Barter he will have 1*s.* 11½*d.* per Yard. M has

M has Broad Cloth at 17*s.* 11*d.* per Yard, how muſt M rate his Broad Cloth in Barter, to advance it in Proportion to L's advance of his Linen, and how many Yards of Broad Cloth muſt M give for 675 Yards of Linen.

Anſ. The Broad Cloth muſt be rated at 19*s.* 11*d.* and 67½ Yards of it given for the Linen ?

6. A Merchant ſends to Spain 1300 Pieces of Broad Cloth, each Piece 47 Yards, at 15*s.* 6*d* per Yard, to have in return from thence, the one half in Wine, at 65*l.* per Tun; the other half in Oranges, at 3*l.* 10*s.* per Cheſt; what Quantity of each will he receive?

Anſ. 364*t.* 1*hhd.* Wine, and 6764 Cheſts of Oranges.

LOSS AND GAIN.

LOSS and Gain is beſt performed by dividing it into two Caſes.

CASE I.

The buying and ſelling Prices given to find the Gain or Loſs per Cent.

RULE. As the Price given for any Article, is to the Gain or Loſs in the ſame Denomination; ſo is 100*l.* to the Gain or Loſs in Pounds, &c.

EXAMPLES.

1. When Cotton is bought at 4*s.* 8*d.* per Yard, and ſold for 6*s.* per Yard, what is the Gain per Cent.?

That is, if 100*l.* was laid out for Cotton, at 4*s.* 8*d.* per Yard, and that it was all ſold at 6*s.* per Yard, what would the Gain be?

s. *d.*
6 0
4 8 = 56*d.*
1 4 = 16*d.* Gain by laying out 4*s.* 8*d.*

As 56*d* : 16*d* : : 100*l* : 28*l.* 11*s.* $5\frac{1}{7}$*d.*

2. Bought Tea at 6*s.* 6*d.* per Pound, and ſold it at 7*s.* 3*d.* per Pound, how much is the Gain per Cent.?

Anſ. 11*l.* 10*s.* $9\frac{3}{13}$*d.*

3. If 5 Hundred 3 Quarters 16 Pound of Sugar coſt 2*l.* 6*s.* 8*d.* per Hundred, and be ſold at 6*d.* per Pound, what is the Gain or Loſs by the Whole, and alſo per Cent.?

Anſ. The whole Gain is 2*l.* 15*s.* and per Cent. 20*l.*

4. Bought 5 Pieces of Holland, each containing 56 Ells Flemiſh, at 3*s.* 2*d.* per Ell, what ſhall I gain in the Whole; and what per Cent. if I ſell it for 5*s.* 8*d.* per Ell Engliſh?

Anſ. the whole Gain 3*l.* 5*s.* 4*d.* and per Cent.

5. Bought 720 Yards Muſlin at 6*s.* 6*d.* and ſold it at 7*s.* 6*d.* At the ſame Time 480 Yards Cambric at 8*s.* 4*d.* which was ſold for 9*s.* 8*d.* how much more was gained in the Whole by one Bargain, than by the other; and what was the Difference of the Gains per Cent.?

Anſ. 4*l.* was gained more by the Muſlin on the Whole than by the Cambric; but the Gain per Cent. was 12*s.* $3\frac{9}{13}$*d.* in favour of the Cambric.

CASE II.

The buying Price, and Gain per Cent. given, to find the ſelling Price.

RULE. As 100*l.* : 100*l.* added to the propoſed Gain : : the buying Price : the ſelling Price.

EXAMPLES.

1. If Brandy be bought at 8*s.* per Gallon, how muſt it be ſold to gain 12*l.* 10*s.* per Cent. ?

As 100*l* : 112.5*l* : : 8*s* : 9*s*.

2. When Sattin is bought for 7*s.* 6*d.* per Yard, how muſt it be ſold to gain 10*l.* per Cent. *Anſ.* 8*s.* 3*d.*

3. Bought 4 Hundred 2 Quarters 14 Pounds of Tea at 29*l.* 8*s.* per Hundred, and paid Charges on the Whole 25*l.* 18*s.* how muſt it be ſold per Pound to gain 6$\frac{2}{3}$*l.* per Cent. and what will be the total Gain ?

Anſ. The ſelling Price 6*s.* 8*d.* per Pound and the total Gain 10*l.* 15*s.* 10*d.*

4. A Linen-draper ſold Cotton at 4*s.* 8*d.* per Yard, and thereby gained 16$\frac{2}{3}$*l.* per Cent. what had the Cotton coſt him per Yard ? *Anſ.* 4*s.*

5. A Tea Merchant mixed a Quantity of Tea, ſtanding him in 4*s.* 2*d.* per Pound, with an equal Quantity of other Tea at 5*s.* 4*d.* per Pound, how muſt he ſell the Mixture per Pound, to gain 30*l.* per Cent. ?

Anſ. 6*s.* 2$\frac{1}{10}$*d.*

6. If Wine be ſold at 12*s.* per Gallon, and thereby 12$\frac{1}{2}$ per Cent. gained, what was it bought for ?

As 112.5*l.* : 100 : : 12*s.* : 10*s.* 8*d.* the *Anſ.*

7. Silk being ſold at 18*s.* per Yard, and thereby 20*l.* per Cent. gained, how much was given for it.

Anſ. 15*s.*

8. If by ſelling Muſlin at 5*s.* 8*d.* per Yard, the Gain per Cent. be 6*l.* 5*s.* how much would it be, if the Muſlin was ſold for 6*s.* 4*d.* per Yard?

As 5*s.* 8*d.* : 6*s.* 4*d.* : : 106*l.* 5*s.* : 118*l.* 15*s.* then 118*l.* 15*s.* – 100*l.* = 18*l.* 15*s.*

9. A Grocer ſold Sugar at 9*d.* per Pound, and gained 12$\frac{1}{2}$*l.* per Cent. what would his Gain have been per Cent. if he had ſold it for 1$\frac{1}{2}$*d.* more per Pound?

Anſ. 31*l.* 5*s.*

10. Bought 288 Yards of Sattin at 8*s.* per Yard, the Charges being 14*l.* 8*s.* how muſt 1 Yard be ſold to gain 18*l.* per Cent. and what will be the total Gain.

Anſ. 10*s.* 7$\frac{1}{4}$*d.* and the whole Gain 23*l.* 6*s.* 6$\frac{3}{4}$*d.*

11. Cotton being bought at 2*s.* 8*d.* per Yard, and proving to be of a worſe Quality than the Purchaſer expected it to be, he is willing to loſe 10*l.* per Cent. how muſt he ſell it?

As 100*l.* : 90*l.* : : 2*s.* 8*d.* : 2*s.* 4$\frac{4}{5}$*d.* per Yard.

12. Two Horſes were bought for equal Prices. One of them was ſold for 60*l.* and 20*l.* per Cent. gained by him; but the other was ſold ſo, that 20*l.* per Cent. was loſt by him; how much was the latter ſold for, and what was the prime Coſt of each?

Anſ. The latter was ſold for 40*l.* and each coſt 50*l.*

EXCHANGE.

EXCHANGE is the receiving Money in one Country, for the Value of it, in another Country.

The Par of Exchange is when the Money received in one Country is of the ſame real Value, as the Money delivered in another.

The Courſe of Exchange is the Rate at which Bills are bought, and varies daily, according to the Demand for them. It is ſeldom equal to Par.

TABLES of FOREIGN COINS, &c.

I. HOLLAND.

16 Penings = 1 Stiver.
6 Stivers = 1 Flemiſh Shilling.
20 Stivers = 1 Guilder.
6 Guilders = 1 Flemiſh Pound.

Accounts are kept in Flemiſh Pounds, Shillings, and Pence. The Par is 35*s.* 6$\frac{2}{3}$*d.* Flemiſh for 1 Pound Sterling.

II. FRANCE.

12 Deniers = 1 Sol.
20 Sols = 1 Livre.
3 Livres = 1 Exchange Crown.

French Accounts are kept in Livres, Sols, and Deniers. The Par is 1 French Crown for 2*s.* 7$\frac{1}{4}$*d.*

III. SPAIN.

34 Maravedies = 1 Rial
8 Rials = 1 Piece of Eight.
10 Rials = 1 Dollar.
36 Rials = 1 Piſtole.

Accounts are kept in Dollars, Rials, and Maravedies. The Par is 1 Piece of Eight = 3*s.* 7*d.*

IV. PORTUGAL.

1000 Reas = 1 Milrea.

Accounts in Milreas and Reas. Par 1 Milrea = 5*s.* 7½*d.*

V. ITALY.

12 Deniers = 1 Sol.
20 Sols = 1 Livre
5 Livres = 1 Piece of Eight at Genoa.
6 Livres = 1 Piece of Eight at Leghorn.

Accounts in Livres, Sols, and Deniers. Par 4*s.* 6*d.* for a Dollar.

Rule. Uſe either Practice, Proportion, or Diviſion, as the Example requires.

EXAMPLES.

1. How many Flemiſh Pounds are equal to 720*l.* Sterling, the Courſe of Exchange being 34*s.* 10*d.* for 1*l.* Sterling?

1*l.* Flemiſh		720
10*s.* - -	2	360
4*s.* - -	5	144
10*d.* - -	12	30
		1254 Flemiſh Pounds.

2. Paid 1000*l.* Sterling for a Bill on Amſterdam, how much Flemiſh is that, Exchange being 35*s.* $5\frac{1}{2}$*d.* Flemiſh for 1*l.* Sterling?

Anſ. 1772*l.* 18*s.* 4*d.*

3. A Merchant at Amſterdam remits to London 1200 Guilders, 12 Stivers, how much Sterling does it amount to, Exchange being 34*s.* 6*d.* Flemiſh for 1*l.* Sterling. *Anſ.* 116*l.*

4. How many Guilders may I have for 118*l.* 15*s.* 6*d.* Sterling, Exchange at 35*s.* 4*d.* Flemiſh per Pound, Sterling? *Anſ.* 125*guil.* 0*ſtiv.* $4\frac{4}{5}$*pen.*

5. How much Bank Money can I have for 1865 Guilders, Current Money, the Agio or Difference being 4 Guilders per Cent.?

	gu. cur.		*gu. bank.*		*gu. cur.*		*gu. b.*	*ſti.*	*pen.*
As	104	:	100	::	1865	:	1793	5	$6\frac{2}{13}$.

6. What Quantity of Flemiſh Currency muſt I have for 285*l.* 11*s.* 6*d.* Sterling, Exchange at 33*s.* 10*d.* Flemiſh Bank per Pound Sterling, and Agio $4\frac{1}{2}$*d.* per Cent. *Anſ.* 504*l.* 16*s.* $8\frac{2}{10}$*d.*

7. Paris remits to London 9620 Livres 12 Sols 4 Deniers at $30\frac{3}{4}$*d.* per Crown, how much Sterling does it come to *Anſ.* 405*l.* 17*s.* $4\frac{3}{4}$*d.*

8. A Perſon in London received 1000*l.* for a Bill on a Merchant in Liſbon, how many Milreas was it for, Exchange being 5*s.* 4*d.* per Milrea?

Anſ. 3750 Milreas.

9. Paid in London 500*l.* for a Bill on Dublin, Exchange at 110 per Cent. how much was the Bill for?

Anſ. 550*l.* Iriſh.

10. A Merchant at Jamaica remits 417*l.* 10*s.* 6*d.* Currency, how much Sterling muſt be received for it, Exchange at 145*l.* per Cent.?

Anſ. 287*l.* 18*s.* $11\frac{17}{29}$*d.*

10. If Bills at London on Amſterdam be 34*s.* $3\frac{1}{4}$*d.* Flemiſh per Pound Sterling, and on Paris at $32\frac{5}{8}$*d.* per Crown; what ought to be the Rate of Exchange between Paris and Amſterdam? *Anſ.* $59\frac{9}{10}$*d.*

11. If 14 Pounds of Sugar be exchanged for 34 Pounds of Raiſins, and 50 Pounds of Raiſins for $8\frac{3}{4}$. Pounds of Almonds at 20*d.* per Pound, what is the Price of the Sugar per Pound?

PERMUTATION.

PERMUTATION ſhews how often the Situation of Things may be varied; thus, a, b, c, may be placed in ſix different Situations, viz. abc, acb, bac, bca, cab, and cba.

RULE. Multiply the Numbers all into one Product.

EXAMPLES.

1. In how many different Poſitions can 9 Perſons be placed?

Anſ. $1\times2\times3\times4\times5\times6\times7\times8\times9=362880$.

2. How many Changes may be rung on 11 Bells?

Anſ. 39916800.

ARITHMETICAL PROGRESSION.

WHEN any Series or Rank of Numbers increaſe, or decreaſe regularly, they are in Arithmetic Progreſſion, as 3, 5, 7, 9, 11, 13, 15, &c. And 29, 25, 21, 17, 13, &c.

The ſeveral Parts of a Series are.

The leaſt Term.
Common Difference.
Number of Terms.
Greateſt Term.
Sum of the Series.

Any three of theſe being given, the other two readily may be found. This admits of twenty Caſes. The two moſt uſeful ones only, are conſidered in this Treatiſe.

CASE I.

The leaſt Term, Common Difference, and Number of Terms, to find the greateſt Term.

RULE. Multiply the Number of Terms, leſs 1, by the common Difference, and add the leaſt Term.

EXAMPLES.

1. The leaſt Term of a Series in Arithmetic Progreſſion being 10; the common Increaſe 3, and Number of Terms 22, required the greateſt Term.
Anſ. 73.

2. The Maſter of an Academy began with ſeven Scholars, and upon an Average, 3 entered every Week, for 25 Weeks, how many Scholars had he then?
Anſ. 79.

3. A Gentleman travelled 9 Days. The firſt Day 24 Miles, and increaſed 2 Miles every Day, how many Miles did his laſt Day's Journey conſiſt of? *Anſ.* 40.

CASE

CASE II.

Given as before the leaſt Term, common Difference, and Number of Terms to find the Sum of the Series.

Rule. Multiply the Number of Terms leſs 1, by the common Increaſe, add twice the leaſt Term, and multiply the Sum by the Number of Terms.

EXAMPLES.

1. A Debt can be diſcharged in a Year, by paying 8*d.* the firſt Week; 18*d.* the ſecond, and thus continuing always 10*d.* more each Week, what is the Debt?

$$\frac{51\times 10+8\times 2}{2}\times 52=13676d.=56l.\ 19s.\ 8d.$$

2. If 150 Stones were placed 2 Yards from each other, and the firſt 2 Yards from a Baſket, how far muſt the Perſon go to bring them one by one into the Baſket?

The leaſt Term is 4, and greateſt 300, when theſe are known, the Sum of the Series is found by multiplying half their Sum by the Number of Terms.

$$\frac{4+300}{2}\times 150=15300yds=8mil.\ 1220yds.$$

3. How often does a Clock ſtrike in 24 Hours?

Anſ. 156.

If theſe two Caſes be well underſtood, there will be no Difficulty in performing any of the other.

GEOME-

GEOMETRICAL PROGRESSION.

ANY Series of Numbers, increaſing by a common Multiplier, or decreaſing by a common Diviſor, are in Geometrical Progreſſion. The common Multiplier or Diviſor, is called the Ratio.

CASE I.

The leaſt Term, Ratio, and Number of Terms given to find the greateſt Term.

RULE. Multiply the Ratio, as often by itſelf, except once, as there are Number of Terms, and multiply the Product by the leaſt Term.

EXAMPLES.

1. The leaſt Term of a Series in Geometrical Progreſſion, being 10, the Ratio 2, and Number of Terms 13, what is the greateſt, or thirteenth Term?

When 2 the Ratio is multiplied 12 Times by itſelf, the Product is 4096, which multiplied by 10, the leaſt Term, the greateſt Term is found 40960.

2. A Servant agreed with a Farmer to ſerve 12 Years, and to have nothing for his Service but the Produce of a Wheat Corn for the firſt Year, and that Produce to be ſowed for the ſecond Year, and ſo on from Year to Year, until the End of the ſaid Time. Required the

Worth of the laſt Year's Produce, if the Increaſe be every Year tenfold; that 49152 Wheat Corns make a Buſhel, and that the Whole is ſold at 6*s*. per Buſhel?

Anſ. 678168*l*. 6*s*.

CASE II.

The leaſt Term, Ratio, and Number of Terms given as before to find the Sum of the Series.

RULE. Find the greateſt Term by Caſe I. then multiply the greateſt Term by the Ratio; ſubtract the leaſt Term, and divide by the Ratio leſs 1.

EXAMPLES.

1. The leaſt Term of a Geometrical Series being 6, the Ratio 3, and Number of Terms 13, what is the Sum of the Series?

$$3\times3\times3\times3=81=\text{Ratio, four Times multiplied.}$$
$$81\times81\times81=531441=\text{Ratio, 12 Times multiplied.}$$
$$531441\times6=3188646 \text{ Greateſt Term.}$$
$$\frac{3188646\times3,-6}{2}=4782966 \text{ Sum Series.}$$

2. What Debt will be diſcharged in 12 Months, by paying 5*s*. the firſt Month, 10*s*. the ſecond, 20*s*. the third, &c.? *Anſ.* 1023*l*. 15*s*.

3. Two young Gentleman, A and B, ſpeaking of the intended Marriage of the former, A ſaid, give me 10,000*l*. and I will give you Two-pence to Day, Sixpence Tomorrow, Eighteen-pence the third Day, and increaſe in that Manner every Day until I am married.

B agreed, and in 20 Days A married. Which of them had the advantage? *Anſ.* B 14518268*l* 6*s*. 8*d*.

4. A Man bought a Horſe, and by Agreement was to give, a Farthing for the firſt Nail, two for the Second, four for the Third, &c. There were four Shoes, and 8 Nails in each Shoe. Required the Price of the Horſe? *Anſ.* 4473924*l*. 5*s*. 3¾*d*.

CASE III.

The greateſt Term, in a deſcending or decreaſing Series, the Diviſor, and Number of Terms to find the leaſt Term.

Rule. Multiply the Diviſor as often by itſelf, except once, as there are Terms, and thereby divide the greateſt Term.

EXAMPLES.

1. The greateſt Term of a deſcending Series in Geometrical Progreſſion being 6144, the common Diviſor 2, and Number of Terms 12. Required the leaſt Term? *Anſ.* 3.

2. A Perſon laid up a certain Sum on the firſt of January; twice as much on the firſt of February; four Times as much on the firſt of March, and ſo on doubling every Month. The Sum laid up on the firſt of December was 17*l*. 1*s*. 4*d*. What did he begin with, and what did he ſave in all?

Anſ. It was 2d. he began with, and his whole Year's ſaving amounted to 34*l*. 2*s*. 6*d*.

CASE IV.

To find the Sum of an infinite Number of Terms in Geometrical Progreſſion decreaſing.

RULE. Multiply the greateſt Term by the Ratio, and divide by the Ratio – 1.

EXAMPLES.

1. What is the Sum of the Geometrical Series, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, &c. continued infinitely.

The Ratio or common Diviſor is 2, therefore $\frac{1 \times 2}{\text{Ratio}-1} = 2$, is the Anſwer.

2. What is the Sum of the infinite Series $\frac{1}{3}$, $\frac{1}{12}$, $\frac{1}{48}$, $\frac{1}{192}$, $\frac{1}{768}$, &c. *Anſ.* $\frac{4}{9}$.

3. Required the Sum of the infinite Series 10, $\frac{10}{3}$, $\frac{10}{9}$, $\frac{10}{27}$, $\frac{10}{81}$, $\frac{10}{243}$, &c. *Anſ.* 15.

EVOLUTION.

A TABLE of ROOTS and POWERS.

Root	1	2	3	4	5	6	7	8	9
Square	1	4	9	16	25	36	49	64	81
Cube	1	8	27	64	125	216	343	512	729
Biquadrate	1	16	81	256	625	1296	2401	4096	6561
Surſolid	1	28	243	1024	3125	7776	16807	32768	59049

A Number is ſaid to be ſquared or involved into the ſecond Power, when it is multiplied by itſelf, thus, 24×24=576 is the Square or ſecond Power of 24 . . A Number multiplied three Times produces the Cube. Thus, 16×16×16=4096, is the Cube, or third Power of 16. The Biquadrate is when a Number is multiplied four Times . . A Surſolid is the Fifth Power.

The Square Root is the very reverſe of the Square, thus, the Square of 25 is 625, but the Square Root of 25 is 5. The Cube of 8 is 64, but the Cube Root of 8 is 2.

EXTRACTION of the SQUARE ROOT.

Rule. When the Number to be extracted conſiſts of two, four, ſix, eight, &c. Figures, the two firſt make the firſt Period ; but if the Number conſiſts of three, five, ſeven, nine, &c. Figures, the firſt Figure alone is the firſt Period. The firſt Figure to be put in the Quotient is the Root of the neareſt Square to the firſt Period not greater.

Place that neareſt Square under the firſt Period, ſubtract, and bring down two Figures to the Remainder, for a new Dividend. Twice the Quotient or Root is a Diviſor to this Dividend. Enquire as in Diviſion, how often the Diviſor is in the new Dividend, diſregarding at that moment the laſt Figure. Place the Quotient Figure both in the Quotient and Diviſor. Multiply by it. Subtract, and bring down the next two Figures. Double the Quotient for another Diviſor. Proceed thus, until all the Figures are brought down.

If there be Decimals, cut off half their Number in the Root . . When a Fraction is given, extract both Numerator and Denominator, if they each can be ſo,

without

without any Remainder; if not, reduce the Fraction into a Decimal.

EXAMPLES.

1. Required the Square Root of 45346756; in other Words what Number multiplied by itſelf will produce 45346756.

```
        45346756(6734
        36
        ------
127)     934
         889
        ------
1343)    4567
         4029
        ------
13464)   53856
         53856
        ------
```

2. What is the Square Root of 1066153104? *Anſ.* 32652.

3. What is the Square Root of 75625? *Anſ.* 275.

4. Required the Square Root of 162899417664? *Anſ.* 403608.

5. Required the Square Root of 69405.9025? *Anſ.* 263.45.

6. What is the Square Root of 262169.600625. *Anſ.* 512.025.

7. Required the Square Root of 18495160.36? *Anſ.* 4300.6.

8. What is the Square Root of 155.451024? *Anſ.* 12.468.

9. Extract the Square Root of 8532, and continue the Extraction until there are four Decimals in the Root. It will be neceſſary to add eight Cyphers.

Anſ. 92.368.

10. What is the Square Root of 285.78648? When there is an odd Decimal, add a Cypher.

Anſ. 16.905.

11. What is the Square Root of .002809?

Anſ. .053.

12. Required the Square Root of $\frac{1156}{3844}$?

Anſ. $\frac{34}{62}=\frac{17}{31}$.

13. Required the Square Root of $\frac{36}{49}$? *Anſ.* $\frac{6}{7}$.

14. What is the Square Root of $\frac{2}{5}$. *Anſ.* 6324.

15. What is the Square Root of $69\frac{4}{9}$? *Anſ.* $8\frac{1}{3}$.

16. Required the Square Root of the Cube of 64?

Anſ. 512.

17. If a Room be 44 Feet in length, and 33 Feet in breadth; what is the Diagonal of it, or Diſtance from one Corner to the alternate one? *Anſ.* 55*ft.*

18. What is the Diagonal of a Square Field, each Side whereof is 12 Chains? *Anſ.* 16*ch.* 97*lks.*

19. If a Ladder 24 Feet long, be placed 6 Feet from the Bottom of a Wall, and the other End reaches exactly to the top of the Wall, how high is the Wall?

Anſ. 23.23*ft.*

20. There is a Wall 48 Feet high, which has a Ditch 36 Feet wide; how long muſt a String be to reach from the top of the Wall, to the outſide of the Ditch?

Anſ. 60*ft.*

21. If 961 Soldiers are to be placed in a Square, how many muſt be in Rank and File? *Anſ.* 31.

22. There is a Room which is 40 Feet long, 30 broad, and 12 high; how far is it from one of the Angles or Corners, on the Floor, to the alternate Corner at the Top? *Anſ.* 51.4*ft.*

EXTRACTION of the CUBE ROOT.

RULE. Divide the Number of Figures of which the given Cube conſiſts by 3, not including the Decimals, if any. When nothing remains, the firſt three Figures conſtitute the firſt Period; if the Remainder be 2, the firſt Period muſt conſiſt of the two firſt Figures; and if 1 remains, the firſt Figure is the firſt Period.

The Root of the neareſt Cube to the firſt Period is the firſt Figure of the Root. Subtract that neareſt Cube from the firſt Period, and to the Remainder bring three Figures to conſtitute a Minuend.

Multiply the Square of the Root always by 300 for a Diviſor, and find how often the Diviſor is contained in the Minuend. Place the Quotient Figure in the Root, and multiply the Diviſor by it. Call this Product A.

Square the laſt Figure of the Root; multiply that Square by the preceding Part of the Root, and the Product always by 30. Call this product B.

To the Product A add the Product B, and the Cube of the laſt Figure of the Root. Subtract the Sum from the Minuend, and bring three Figures to the Remainder to make a new Minuend.

Multiply the Square of the Root by 300 for a new Diviſor, and with this Diviſor and Minuend, and with all the following, proceed as with the former.

Every Minuend is found by bringing three Figures to the Remainder; and every Diviſor, by multiplying the Square of all that Part of the Root which is found, by 300.

EXAMPLES.

1. Extract the Cube Root of 379503424.

379503424 (724 Cube Root
343

14700) 36503

29400 A. The Diviſor × 2 = 29400 = A.
840 B. 2 × 2 × 7 × 30 = 840 = B.
8 Cube of 2.

30248

1555200) 6255424 Minuend

6220800 A. Diviſor × 4 = A
34560 B. 4 × 4 × 72 × 30 = B
64 Cube of 4

6255424

....

7 × 7 × 300 = 14700 The firſt Diviſor.
72 × 72 × 300 = 1555200 The ſecond Diviſor.
Proof. 724 × 724 × 724 = 379503424.

2. What is the Cube Root of 670381355008.
Anſ. 8752.

3. Required the Cube Root of 841232384?
Anſ. 944.

4. Required the Cube Root of 32921840125?
Anſ. 3205.

5. What is the Cube Root of 216378220542875?
Anſ. 60035.

6. What is the Cube Root of 155894602968?

Cut off one-third of the Decimals in the Root that are cut off in the given Cube. The Root in this Example is 53.82.

7. Required the Cube Root of 149.890531328?
Anſ. 5.312.

8. Required the Cube Root of 149.890531328?
Anſ. 5.312.

If the Number of the given Decimals be not diviſible by three, add a Cypher or two to them before the Operation.

9. Required the Cube Root of 42.2329?
Anſ. 3.48+

10. Required the Cube Root of 65.2?
Anſ.

11. What is the Cube Root of .238328? *Anſ.* 62.

12. What is the Cube Root of .079507?
Anſ. .43.

13. What is the Cube Root of .000009800344?
Anſ. .0214.

14. What is the Cube Root of .79. *Anſ.* .924+

15. Required the Cube Root of $\frac{2197}{3375}$? *Anſ.* $\frac{13}{15}$.

16. Required the Cube Root of $\frac{729}{10648}$? *Anſ.* $\frac{9}{22}$.

17. What is the Cube Root of $\frac{5}{8}$? *Anſ.* 855.

18. A Gentleman has a Ciſtern, whoſe Length, Breadth, and Depth, are each 34 inches. He wiſhes to have another to contain three Times as much as the preſent one, and its Length, Breadth and Depth alſo equal. Required the Size of it?
Anſ 49 Inches each Dimenſion.

EX-

EXTRACTION IN GENERAL.

RULE. If the Number of Figures to be extracted, excluſive of the Decimals, be diviſible by the power, the Number of Figures in the firſt, as well as in the others, will be the ſame as the Power. When there is a Remainder, it ſhews the Number of Figures in the firſt Period. The Power always ſhews the Number in the Others. Take the neareſt Biquadrate, Surſolid, &c. according to the given Power, from the firſt Period, and join the firſt Figure of the ſecond Period to the Remainder. Raiſe the Root to a Power within one of the given Power, and multiply by the Exponent * of the given Power. With the Product as a Diviſor, find another Figure to put in the Root. Raiſe the Root as it now ſtands into the given Power. Subtract from the two firſt Periods, and bring the firſt Figure of the next Period, to the Remainder. Proceed thus until the firſt Figure of every Period is uſed.

If the Root when raiſed is more than the Periods it has to be taken from, the laſt Figure muſt be leſſened.

EXAMPLES.

1. Extract the Biquadrate Root of 856446597136.

856446597136 (962 Anſwer.
6561

2916) 20034

84934656 Subtrahend.

3538944) 7100037

---

* The Exponent of the Biquadrate is 4; of the Surſolid 5, &c.

$9^3 \times 4$

$9^3 \times 4 = 2916$, The firſt Diviſor.
$96^3 \times 4 = 3538944$, Second Diviſor.
Proof $962 \times 962 \times 962 \times 962 = 856446597136$.

The Biquadrate Root may alſo be found by extracting the Square Root, and then the Square Root of that Root.

2. What is the Root of the ſeventh Power 9642.43425.
Anſ. 3.1.

SINGLE POSITION.

IN Poſition falſe Numbers are aſſumed, and by a proper Management of theſe, the true Anſwers are found.

Single Poſition anſwers ſuch Queſtions as require Numbers proportional to each other.

It requires only one Suppoſition, or Aſſumption.

Rule. Take a Number as if it was a true One, and derive others from it, by the nature of the Queſtion. Then,

As the Sum of the falſe Numbers
Is to the firſt ſuppoſed Number,
So is the Sum mentioned in the Example
To the real Anſwer, correſponding to the firſt
ſuppoſed Number.

EXAMPLES.

1. A, B, and C bought Rum to the Amount of 616*l.* B paid twice as much as A, and C four Times as much as B. What did each pay?

Suppoſe A 1*l.*
Then B 2
And C 8

11 : 1 :: 616 : 56*l.* paid by A
112*l.* - - B
448*l.* - - C

Proof 616*l.*

2. A Perſon having a Number of Guineas, was aſked how many he had. He replied that if one-half, one-third, and one-fourth of them were added, the Sum would be 715. Required the Number?

Anſ. 660 Guineas.

3. A Gentleman diſtributed 78 Pence among a Number of poor People, conſiſting of Men, Women, and Children. To each Man he gave 6*d.* to each Woman 4*d.* and to each child 2*d.* There were twice as many Women as Men, and thrice as many Children as Women; how many were there of each?

Anſ. 3 Men, 6 Women, and 18 Children.

4. One being aſked his Age, replied, that if $\frac{2}{5}$ of the Years I have lived be multiplied by 7; and $\frac{5}{7}$ of this Product be divided by 3 the Quotient will be 20. What was his Age?

Anſ. 30 Years.

5. A, B, C, and D have 266*l.* to receive; B to have twice as much as A; C thrice as much as B; and D five Times as much as A. How much will each receive?

Anſ. A 19*l.* B 38*l.* C 114*l.* and D 95*l.*

DOUBLE POSITION.

WHEN Numbers are connected by the Addition or Subtraction of other Numbers, it is Double Poſition, as it requires two Suppoſitions or Aſſumptions.

Rule. Multiply the firſt Suppoſition by the ſecond Error; and the ſecond Suppoſition by the firſt Error. If the Suppoſitions are both too great, or both too little, ſubtract theſe Products for a Dividend, and the two Errors for a Diviſor.

But if the one Suppoſition is too great, and the other too little, add the Products, and add the Errors. In both Caſes the Quotient is the Anſwer.

EXAMPLES.

1. B has 50*l.* more than thrice as much Money as A; C has 120*l.* more than four Times as much as B, and they have amongſt them 3826*l.* how many Pounds had each?

1. Suppoſe	A	100	From	3826
Then	B	350	Take	1970
And	C	1520		
		1970	1. Error	1856
2. Suppoſe	A	200	From	3826
Then	B	650	Take	3570
And	C	2720		
		3570	2. Error	256

1856 × 200 = 371200
256 × 100 = 25600

Difference Errors 16,00)3456,00(

216 A
698 B
2912 C

Proof 3826 Pounds.

2. A Schoolmaſter being aſked how many Scholars he had, ſaid that $\frac{1}{5}$ of them were in Engliſh; $\frac{1}{4}$ in Writing; $\frac{1}{3}$ in Arithmetic; and the Remainder 26 in the Mathematics; how many had he? *Anſ.* 120.

3. A has 40 Guineas more than B, who has 42 more than C, and C has one third the Number of A; how many has each? *Anſ.* A 123. B 83. C 41.

4. The Income of a Gentleman being 20*l.* weekly, how much may he ſpend per Week, to ſave yearly 200*l.* added to 4 Weeks expences? *Anſ.* 15*l.*

5. Tommy was a Boy noted for underſtanding Figures. His Father ſaid to him one Day, Tommy, I have always concealed both my Age and your's from you; but I now tell you that I am five Times your Age; and that if we both live 30 Years more, I ſhall be only twice your Age then; pray what are our Ages?

Tommy preſently anſwered, Father you are 50, and I am 10.

6. A Hare being 50 of her own Leaps before a Greyhound, makes 4 Leaps to the Greyhound's 3; but 2 Leaps of the Greyhound are equal to 3 Leaps of the Hare; how many Leaps muſt the Greyhound take to come up with the Hare? *Anſ.* 300.

7. John and William have each a Sum of Money. One half of John's added to 420*l.* is equal to William's; and one-fifth of William's added to 456*l.* is equal to John's, how much belonged to each?

Anſ. John 600*l.* and Willliam 720*l.*

8. A Man bought a Piece of Cloth for 50 Shillings, and after cutting off 10 Yards, ſold the Remainder for what the piece coſt him, by which he gained 3*d.* per Yard; how many Yards were in the Piece, and how much did it coſt him per Yard?

Anſ. 50 Yards, at 1*s.* per Yard.

BILLS OF PARCELS.

Mrs. Manners

Bought of Samuel Draper,

1787.			*s.*	*d.*		*l.*	*s.*	*d.*
Sept. 4.	16 Ells of Dowlaſs	at	1	4	per Ell - - - - - -			
	21 Ells of Holland	at	3	6	- - - - - - - - -			
	11 Yards of Muſlin	at	10	6	- - - - - - - - -			
	20 Yards of Cambric	at	12	6	- - - - - - - - -			
	49 Ells of Diaper	at	2	2	- - - - - - - - -			
	19 Ells of Damaſk	at	5	3	- - - - - - - - -			
						33	6	3

Mr. Samuel Surepay

Bought of John Gould,

					l.	*s.*	*d.*		*l.*	*s.*	*d.*
Z	1788. *Jan.* 11.	48	China Plates	at	0	3	6	each			
		16	Diſhes ditto	at	0	10	0				
		3	Pair of Jars	at	5	10	6				
			A Set of China compleat.						3	11	6
		4	Large China Bowls	at	0	16	0	each			
			A Set of Breakfaſt China						1	11	6
									£ 41	6	6

Mrs. Ann Bryſon

Bought of Jacob Hoſier,

			s.	d.		l.	s.	d.
1787. *Dec.* 10.	14 Pair of Women's Worſted Hoſe	at	3	4	per Pair - -			
	21 Pair of Men's Silk - - -	at	16	0	- - - -			
	26 Pair of Men's Yarn - - -	at	1	4	- - - -			
	16 Pair of Men's Mixt - - -	at	5	6	- - - -			
	36 Pair of Thread - - - -	at	2	9	- - - -			
	12 Pair of Men's Silk Gloves -	at	5	0	- - - -			
						£ 34	11	4

Mrs. Sarah Lidyard

Bought of William Dipper,

				l.	*s.*	*d.*		*l.*	*s.*	*d.*
1787. *Oct.* 19.	72	Dried Salmon - - -	at	0	1	3	each - - - - -			
	8½	Barrels of Herrings -	at	3	8	6	- - - - - -			
	5	Kegs of Sturgeon -	at	0	18	6¼	- - - - - -			
	4¼	Hundred of Stockfiſh	at	4	11	6	- - - - - -			
	½	Hundred of Ling -	at	8	10	0	- - - - - -			
	2	Hundred of Haberdine	at	6	18	10	- - - - - -			
							£	76	18	3¼

Mrs. Ann Armſtrong

Bought of Alice Lemon,

				s.	*d.*		*l.*	*s.*	*d.*
1787.									
Sept. 8.	18	Pomegranates - - - -	at	0	4¼	each - - - -			
	24	Dozen of China Oranges	at	1	1½	per Dozen - -			
	17	Dozen of Seville Ditto -	at	1	0	- - - - - -			
	2	Buſhels of Spaniſh Cheſnuts	at	7	4	per Buſhel - -			
	9	Ropes of Ditto Onions -	at	1	6	each - - - -			
	10	Dozen of Lemons - -	at	3	2	per Dozen - -			
							£ 5	0	2½

Samuel Willis, Eſq;

Bought of John Miller,

1787.			*s.*	*d.*		*l.*	*s.*	*d.*
Oct. 18.	21 Pounds of Sugar - - - -	at	0	9	per Pound -			
	18 Pounds of ditto double refined	at	1	3	- - - - -			
	10 Pounds of Royal Green Tea	at	16	0	- - - - -			
	7 Pounds of Bohea Ditto - -	at	8	6	- - - - -			
	14 Pounds of Imperial ditto -	at	19	6	- - - - -			
	15 Pounds of Turkey Coffee - -	at	7	6	- - - - -			
						£ 32	3	3

Edward Lillywhite

Bought of Adam Beacham,

				s.	d.		l.	s.	d.
1787. *Sept.* 24.	9	Large oiled Lamb Skins	at	1	4½	per Skin - - - -			
	60	Ruſſia Hides - - -	at	12	9	- - - - - - -			
	120	Goat Skins - - -	at	1	2	- - - - - - -			
	19	Calves Skins - - -	at	4	8	- - - - - - -			
	132	Sheep Skins - - -	at	1	6	- - - - - - -			
	16	Buck Skins - - -	at	16	6	- - - - - - -			
							£ 73	8	0½

William Burton

Bought of Joſeph Harris,

				s.	d.		l.	s.	d.
1787 *July* 30.	9	Turkies	at	4	6	each			
	27	Rabbits	at	1	1				
	19	Fowls	at	2	6				
	36	Pounds of Pork	at	0	7	per Pound			
	7	Geeſe	at	4	9	each			
	11	Wild Ducks	at	3	0				
							£ 10	4	6

Various Forms of Acquittances upon Receipt of Money by Maſters and Agents.

RECEIVED October 1ſt, 1787, of Meſſrs. John Simmonds and Samuel Thompſon, five Hundred and five Pounds on Account,

£ 505 Per John Williams.

Received November 7th, 1787, of the Honourable Lady Jane Strawberry, the Sum of one Hundred and forty Pounds, in full of all Demands, for Self and Company.

£ 140 Per Frederic Bacon.

Received November 9th, 1787, of Mr. Bennet Brown, twenty Pounds in full, for the Difference of two thouſand Pounds Bank Stock.

£ 20 Per Felix Necraſoff.

Received November 27th, 1787, of Mr. John Martin, thirty Pounds, in full, for twelve Months Intereſt of ſix Hundred Pounds, due at Chriſtmas laſt.

£ 30 Per James Ibbett.

Received February 21ſt, 1788, of Mr. Thomas Stone, the Sum of twenty-five Pounds in full, for half a Year's Rent, due at Chriſtmas laſt, out of which, deducted for Taxes five Pounds. I ſay, received for, and by Order of Thomas Dalton, Eſq.

£ 25 Per Francis Kimber.

Received March 4th, 1788, of the Executors of the late James Short, Eſq; by the Hands of Mr. Francis Lidyard, the Sum of ſeventy Pounds in full, for my half Year's Annuity, due at Chriſtmas laſt.

£ 70 Per Mary Hudſon.

Various Forms of Acquittances, when an Apprentice or Servant receives Money for the Uſe of his Maſter or Employer.

RECEIVED March 6th, 1788, of Mr. John Williams, ten Pounds ſix Shillings, for my Maſter Felix Necraſoff, on Account.

£ 10 6 0 Per Edward Hyde.

Received October 25th, 1787, of Thomas Stephens, forty-nine Pounds ſeven Shillings and Sixpence in full, for my Maſter James Dunn.

£ 49 7 6 Per John Smith.

Received April 15th, 1788, of the Honourable Eaſt-India Company, by the Hands of Mark Small, Eſq; one Thouſand Pounds, for Mr. Swaddle and Company.

£ 1000 Per James Trueman.

Received March 11th, 1788, of the Worſhipful Company of Mercers, by the Hands of Mr. John Young, ninety-four Pounds, for my Father Edward Simmonds.

Per Joſeph Simmonds.

£ 94

Received April 4th, 1788, of the Right Honourable Sir James Parade, Baronet, and Lord Mayor of London, forty Pounds, for the Uſe of the Artillery Company, London.

£ 40 Per Abraham Long, Clerk.

Received April 11th, 1788, of Mr. John Ely, ten Pounds for a Quarter's Rent, due at Lady laſt, for my Maſter Samuel Trueman.

£ 10 Per Frederic Bacon.

Received December 16th, 1787, of Mr. Samuel Shuffle, thirty Pounds, ten Shillings and Sixpence, in Part of a Bill of eighty-four Pounds, due the 11th Inſtant to Mr. John Kind.

£ 30 10 6 Per William Eaſy.

Received December 18th, 1787, of Mr. Edward Syms and Company, one Hundred Pounds for Mr. William Tomkinſon and Company.

£ 100 Per John Smith.

Promiſſory Notes by Bankers Apprentices and Servants.

London, September 27th, 1787.

I PROMISE to pay the Honourable Thomas Stephens, Eſq; or Bearer, on Demand, fifty Pounds.
For Sir John Davis and Partners,

£ 50 John Day.

London, September 5th, 1787.

I promiſe to pay to the Honourable Directors of the Engliſh Company, trading to the Eaſt-Indies, or Bearer on Demand, five Hundred Pounds.

For my Father James May,
£ 500 Richard May.

London, September 7th, 1787.

I Promiſe to pay Mr. James Jennings, or Bearer, on Demand, ten Pounds fifteen Shillings and four-pence three Farthings,

For my Maſters Turner and Burton,
Amos Trueman.

Pro-

Promiſſory Notes by Maſters.

I Promiſe to pay Mr. Edward Lillywhite, or Bearer, on Demand, one Hundred Pounds. Auguſt 19th, 1787.

Simon Goodwill.

£ 100

I promiſe to pay to the Governor and Company of the Bank of England, ten Thouſand Pounds.

For Self and Partners. November 17th, 1787.

£ 10000 Tobias Freeman.

London, *Auguſt*, 14th, 1787.

I promiſe to pay James Penman, Eſq; Caſhier of his Majeſty's Revenue of Exciſe, or Order, forty Days after Date, five Hundred Pounds, Value received.

£ 500 Peter Brown, Collector.

I promiſe to pay Peter Head, Eſq; or Order, on Demand, two Hundred and ninety-five Pounds five Shillings and Sixpence, Value received this 24th of Auguſt, 1787.

Per Thomas Brownlow.

£ 295 5 6

I promiſe to pay Sir James Turner, or Order, the Sum of forty Pounds in Manner following; ten Pounds Part more the 18th of September next; and the remaining twenty Pounds, the 18th of November next following; Value received; Witneſs my Hand, at London, the 18th of September, 1787.

David Harris.

£ 40

Abingdon, November 17th, 1787, 100*l.*

Borrowed and received of Mr. Jacob Friendly, the Sum of one Hundred Pounds Sterling, which I promiſe to pay the ſaid Jacob Friendly, or Order, on Demand; Witneſs my Hand,

Witneſs { James Long,
George Gay. Nathaniel Needy.

Promiſſory Notes ſhould always mention the Value received, if the Thing itſelf be not ſpecified; this gives them Force in a Court of Judicature.

A Promiſſory Note mentioning Order, is indorſible from one Perſon to another, which is done by the preſent Poſſeſſor's writing his Name on the Back of it, and delivering it up to the Party to whom he intends to aſſign over his Property therein.

Promiſſory Notes, and Book Debts if not legally demanded in the Space of ſix Years, are not to be recovered by Law.

If you keep a Promiſſory Note on Demand, in your Hands more than three Days, and the Perſon it is upon ſhould fail, the Loſs will be your own, but if he fails within the three Days, it falls on the Perſon that paid it to you.

DUODECIMALS.

DUODECIMALS is the multiplying of Feet, Inches, &c. by Feet, Inches, &c. which is performed by any of the four following Rules.

RULE 1. Begin with the Feet of the Multiplier, and multiply it into the ſeveral Parts of the Multiplicand, beginning at the loweſt Denomination, carry one for every 12, except in carrying from one Figure of Feet to another. Multiply in the ſame Manner, the Inches into the Multiplicand, ſetting the firſt Figure of the Product one more to the Right, than the laſt Figure of the Line above it. If there be Parts or Seconds, proceed in the ſame Manner with them. The Sum of the ſeveral Products is the Anſwer. This Method is called *Croſs Multiplication.*

RULE 2. Multiply by the Feet, as in the former Rule, and find the Anſwer for the Inches by aliquot Parts of a Foot, ſimilar to taking aliquot Parts of a Pound in Practice. This is generally the ſhorteſt Way.

RULE 3. Reduce the Inches, &c. into the Decimal of a Foot, and then multiply, cut off, and find the Value by Decimals. If beſides Feet, there be 3, 6, or 9 Inches, only, this is a conciſe enough Method, but if there be any other Number of Inches, or Inches and Parts, this Method ſhould not be uſed.

RULE 4. Reduce both Multiplicand and Multiplier to their leaſt Denominations, then multiply them together for a Dividend. For a Diviſor, multiply 12 as often by itſelf as it was uſed in reducing both the Multiplicand, and Multiplier. If the Terms conſiſt only of Feet and Inches, which is indeed generally the Caſe, this is a Rule which ſome will prefer for its being plain.

E X A M P L E S.

1. Multiply 32 Feet 9 Inches by 11 Feet 6 Inches.

Method 1.

ft.	*in.*	
32	9	
11	6	
360	3	
16	4	6
376	7	6

Method 2.

		ft.	*in.*	
6	2	32	9	
			11	
		360	3	
		16	4	6
		376	7	6

Method 3.

9 Inches = ·75
6 Inches = ·5
Then 32·75 × 11·5
= 376·625 = 376*ft.* 7*in.* 6*pts.*

Method 4.

ft. *in.*
32 9 = 393 Inches
11 6 = 138 Inches

$$\text{Then } \frac{393 \times 138}{144} = 376\tfrac{5}{8}$$

2. Length of a Wall being 106 Feet 4 Inches, and Height 17 Feet 3 Inches; how many Square Feet does it contain?
Anſ. 1834*ft.* 3*in.*

3. Length of a Room being 29 Feet 7 Inches, and Breadth 18 Feet 2 Inches; how many Square Feet?
Anſ. 517*ft.* 5*in.* 2*pts.*

4. Length of a Wall being 218 Feet 6 Inches, and Height 37 Feet 4 Inches; how many Square Yards?

Note. 9 Square Feet 1 Square Yard for $3\times3=9$.
Anſ. 8157*ft.* 4*in.* $=906\frac{1}{3}$ Square Yards.

5. A Piece of Glaſs being 2 Feet 8 Inches 6 Parts long, and 1 Foot 2 Inches 3 Parts Broad; required the Meaſure of it.
Anſ. 3*ft.* 2*in.* 1*pt.* 8*tds.* 6*ths.*

6. Length of a Piece of Timber being 17 Feet 6 Inches; Breadth 1 Foot 6 Inches, and the Thickneſs 1 Foot 2 Inches; how many ſolid Feet?
Anſ. 30*ft.* 7*in.* 6*pts.*

CHRONOLOGY.

I. TO find if any given Year is Leap Year.

Rule. Divide the given Year by 4. If 0 remains, it is Leap Year; if 1, 2, or 3 remains, it is the 1ſt, 2d, or 3d Year after Leap Year?

EXAMPLES.

1. Is the Year 1788, a Leap Year?

$$\begin{array}{r} 4)\underline{1788} \\ 447.\ 0, \end{array}$$

447. 0, therefore it is Leap Year.

2. Is the Year 1791, a Leap Year?

Anſ. It is is the 3d after Leap Year.

The Years 1800, and 1900, would be Leap Years by the above Rule; but that the civil Account may correſpond with the ſolar Time as near as poſſible, it was ſettled by Parliament in 1752, that only every fourth Century ſhould be Leap Year. Hence 2000 will be a Leap Year.

II. To find the Golden Number, or Lunar Circle.

Rule. Add 1 to the given Year, and divide by 19; the Remainder, after the Diviſion is finiſhed, is the Golden Number. If 0 remains the Golden Number is 19.

AN EXAMPLE.

Required the Golden Numbers for the Years 1788, 1794, and 1799? *Anſ.* 2, 8, and 13.

III. To find the Epact. The Epact of any Year, is the Moon's Age at the beginning of that Year.

Rule. Multiply the Golden Number − 1, by 11, and divide by 30, the Remainder is the Epact.

EXAMPLES.

1. Required the Epact for the Year 1790?

The Golden Number − 1 = 3

11

30) 33(1

30

3 Epact

2. Required the Epact in 1842? *Anſ.* 7.

IV. To find the Dominical Letter, till the Year 1800.

Rule. To the given Year, add one-fourth of itſelf. Divide the Sum by 7, and ſubtract the Remainder from 7. If 1 remains, the Dominical Letter is A, if 2, B, if 3, C, if 4, D, if 5, E, if 6, F, and if 7, it is G.

EXAMPLES.

1. Required the Dominical Letter for the preſent Year 1787?

4)1787
446
―――
7)2233
―――
319. 0

7—0=7, G.

2. Required the Dominical Letters for 1788. Every Leap Year has two Letters.

That which is found by the Rule is for all the Year, except January and February; and the following letter is for January and February. Thus 5 is the Number, and E the Letter by the Rule for 1788, which ſerves for all the Months but the two firſt, and F is the Letter for theſe two.

After the Year 1799, the Number found by the Rule, muſt be increaſed by 1.

3. Required the Dominical for 1803.

4)1803
450
7)2253
321 6

7
6
1+1=2=B

By the Dominical Letter the Day of the Week, correſponding to any Day of the Month, is known by the following Table.

Months	A	B	C	D	E	F	G
January	Sunday	Saturd.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.
Febru.	Wedn.	Tueſd.	Mond.	Sunday	Saturd.	Friday	Thurſ.
March	Wedn.	Tueſd.	Mond.	Sunday	Saturd.	Friday	Thurſ.
April	Satur.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.	Sunday
May	Mond.	Sunday	Saturd.	Friday	Thurſ.	Wedn.	Tueſd.
June	Thurſ.	Wedn.	Tueſd.	Mond.	Sunday	Saturd.	Friday
July	Saturd.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.	Sunday
Auguſt	Tueſd.	Mond.	Sunday	Saturd.	Friday	Thurſ.	Wedn.
Septem.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.	Sunday	Saturd.
October	Sunday	Saturd.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.
Novem.	Wedn.	Tueſd.	Mond.	Sunday	Saturd.	Friday	Thurſ.
Decem.	Friday	Thurſ.	Wedn.	Tueſd.	Mond.	Sunday	Saturd.

The

The USE of the TABLE.

Oppoſite to any given Month, and under the Dominical Letter for the Year, there is the Day of the Week, on which that Month begins. Which being known, it is eaſy to find the Day of the Week on which any other Day of that Month falls. Obſerve that the 1ſt, 8th, 15th, 22d, and 29th Days of a Month, are all on the ſame Day of the Week.

EXAMPLES.

1. On what Day of the Week will November begin in the Year 1787? Oppoſite to November, and under G, is Thurſday, which is the 1ſt of November.

2. On what Day of the Week will April begin in 1788. *Anſ.* Tueſday.

3. On what Day of the Week will his Majeſty's Birth Day be in 1788?

Againſt June, and under E is Sunday, for the 1ſt of June, and therefore the 4th will be Wedneſday.

4. On what Day of the Week will Chriſtmas Day fall in 1790? *Anſ.* Wedneſday.

5. What Day of the Month will the firſt Monday after Michaelmas, 1787, be on? *Anſ.* October 1ſt.

The *Cycle of the Sun* which is a Period of 28 Years, omprehending all the Varieties of the Dominical Leters, is found by adding 9 to the Year, and dividing by 8, the Remainder being the Solar Cycle.

V. To find the Moon's Age, or Number of Days ince the Change.

Rule. Add the Epact, the Day of the Month, and Number belonging to the Month. The Sum is the Age. But if the Sum is above 29 in a Month which has 30 Days, ſubtract 29; and if above 30 in a Month which has 31 Days, ſubtract 30.

The Numbers for the Months are,

January,	February,	March,	April,	May,	June,
0	2	1	2	3	4

July,	Auguſt,	Sept.	October,	November,	December.
5	6	7	8	9	10

EXAMPLES.

1. Required the Moon's Age on December 5th, 1787.

Epact - - - - - - 11
Day Month - - - - 5
Number for December 10

Moon's Age. - - - 26

2. Required the Moon's Age on January 12th, 1788. *Anſ.* 4 Days.

3. Required the Moon's Age on October 16th, 1790? *Anſ.* 8 Days.

VI. To find the Time of the Moon's Southing nearly.

Rule. Multiply the Moon's Age by 4, and divide by 5, the Quotient is the Hours, and twelve Times the Remainder is the Minutes, Afternoon. If above 12 Hours, ſubtract 12, the Remainder is the following Morning.

EX-

E X A M P L E S.

1. Required the Time of the Moon's Southing on October 17th, 1787.

Moon's Age 6
4
5)24
4*h*. 48*m*. afternoon

2. Required the Moon's Southing on January 14th, 1788? *Anſ.* 8*h*. afternoon.

VII. To find the Time of High-water at any given Place.

RULE. To the Moon's Southing, add the Time in the following Tide Table.

	h.	*m.*
Aberdeen, Scotland	0	45
Alborough, England	9	45
Amſterdam, Holland	3	0
Antwerp, Flanders	6	0
Baltimore, Ireland	4	30
Bayonne, France	3	30
Belfaſt, Ireland	10	0
Bremen, Germany	6	0
Briſtol, England	6	45
Cadiz, Spain	4	30
Charles Town, America	3	0
Dover, England	11	15

Dun-

	h.	*m.*
Dunkirk, France — — —	0	0
Edinburgh, Scotland — —	4	30
Good Hope, Cape — — —	3	0
Hull, England — — —	6	0
Liſbon, Portugal — — —	2	15
London — — — —	3	0
Portſmouth, England — — —	11	15
Senegal R. Africa — — —	10	30
Southampton, England — —	0	0
Teneriff I. Atlantic Ocean — —	3	0
Yarmouth, England — — —	9	45

AN EXAMPLE.

Required the Time of High Water at London, and at Briſtol, on October 20th, 1787.

	h.	*m.*		*h.*	*m.*
Moon's Southing	7	12	Moon's Southing	7	12
London - -	3	0	Briſtol - - - -	6	45
Afternoon -	10	12	Next morning	1	57

VIII. Find on what Day after March 20th, the Moon is 15 Days old, that is Full *.

The Sunday next after that Day is Eaſter-Sunday. Shrove-Sunday is 49 Days before Eaſter, and Whit-Sunday is 49 Days after Eaſter?

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* Theſe are called Paſchal Full Moons.

EX-

EXAMPLES.

1. Required Eaſter-Day in 1788.

Epact	22	From	43
March	20	Take	30
Number	1		
		Moon's Age	13
	43		

Therefore it will be full Moon on March 22, which falls on a Saturday, See page 164, and conſequently Eaſter-Day falls on March 23d.

Forty-nine Days before March 23d in a Leap Year, gives February 3d for Shrove-Sunday, and therefore Aſh-Wedneſday, or the firſt Day of Lent is on February 6th.

Forty-nine Days after March 23d, is May 11th, which is Whit-Sunday?

2. Required Shrove-Sunday, Eaſter-Day, and Whit-Sunday, in 1790?

Anſ. Feb. 14th, April 4th, and May 23d.

A GEO-

7.3.36

A
GEOGRAPHICAL TABLE,
SHEWING THE
DIRECT DISTANCE IN ENGLISH MILES,
AND BEARING FROM LONDON,
OF THE
PRINCIPAL PLACES on the EARTH;
And the Probable Time of Sailing to them from London.

E. ſtands for Europe; A for Aſia; Af. Africa; N. A. North America; and S. A. South America.

Places which have a Line — through the laſt Column are Inland Places.

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles	Bearing.	Time of Sailing in Days.
A			
Aberdeen, Scotland, E.	411	N.	7
Abo, Sweden, E.	1028	N.E.bE.	16
Acapulco, Pacific Ocean, S. A.	6220	W.S.W.	164
Alexandria, Egypt, A.	2129	S.E.	42
Algiers, Barbary, Af.	1045	S.bE.	24
Alicant, Spain, E.	880	S.	24
Amazon river, * Atlantic Ocean, S. A.	4622	S.W.bW.	50
Amſterdam * Holland, E.	218	E.bN.	3
Antigua, * I. W. Indies	4140	S.W.bW.	45
Aſcenſion, I. Atlantic Ocean, Af.	1045	S.bW.	50
Aſtracan, Siberia, A.	2430	E.bS.	—
B			
Bagdat, Turkey, A.	2530	S.E.bE.	—
Barbadoes, * I. W. Indies	4300	S.W.bS.	48
Barcelona, Spain, E.	703	S.bE.	28
Bencoolen, Sumatra, I. Eaſt Indies	4262	S.E.bE.	144
Bergen, * Norway, E.	629	N.N.E.	8
Berlin, Pruſſia, E.	572	E.	—
Bermuda, * I. Atlantic Ocean, N. A.	3535	W.S.W.	40
Bern, Switzerland, E.	454	S.E.	—

Courſe is Direct to all the Places marked thus *.

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
Berwick, England, E.	304	N.bW.	6
Bilboa, * Bay of Biſcay, Spain	507	S.bE.	7
Bremen, Germany, E.	382	E.N.E.	5
Breſt, France, E.	286	S.W.	6
Briſtol, England, E.	111	W.	8
Bombay, Eaſt Indies, A.	4590	S.E.bE.	140
Boſton, * New England, N. A.	3390	W.bS.	38
Botany Bay, A.	11140	S.E.bE.	155
C			
Cadiz, Spain, E.	1111	S.S.W.	19
Calcutta, Eaſt Indies, A.	5100	S.E.bE.	134
Candia I. Mediterranean, E.	1356	S.E.	37
Canton, China, A.	6409	E.S.E.	170
Cape Bona, Barbary, A.	1104	S.S.E.	30
——Bonaviſta,*Newfoundland, N. A.	2200	W.	26
—— Clear, Ireland, E.	423	W.	8
—— Coromin, E. Indies	5352	S.E.bE.	136
——Finiſterre, * Spain, E.	945	S.W.bS.	12
—— Florida,* Florida, N. A.	4786	W.S.W.	54
—— Good Hope, Af.	6068	S.bE.	80
—— Horn, S. A.	8900	S.W.bS.	104
—— Matapan, Mediterranean, E.	1527	S.E.	37
—— May, Atlantic Ocean, N. A.	3670	W.bS.	42

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
Cape Naſſau,* Terra Firma, S. A.	4591	S.W.	52
—— Palmas, Guinea, Af.	3500	S.bW.	44
—— St. Auguſtine,* S. A.	4678	S.S.W.	58
—— St. Lucas, California, S.A.	6361	W.S.W.	170
—— St. Sebaſtian, Madagaſcar, I. Af.	6037	S.E.bE.	101
—— St. Vincent, Portugal, E.	1114	S.S.W.	15
—— Southampton, Hudſon's Bay, N. A.	3422	W.bN.	45
—— Verd, Negroland, Af.	2737	S.S.W.	30
—— Victory, Pacific Ocean, S.A.	8753	S.W.	109
Charles Town,* South Carolina, N. A.	4224	W.bS.	47
Cherry I. North Sea, E.	1690	N.N.E.	18
Cochin, Eaſt Indies, A.	5226	S.E.bE.	133
Cologne, Germany, E.	250	E.bS.	—
Columbo, Ceylon I. Eaſt Indies	5460	S.E.bE.	138
Conſtantinople, Turkey, E.	1584	E.S.E.	47
Copenhagen, Denmark, E.	594	N.E.bN.	9
Cork, Ireland, E.	382	W.	8
Corſica I. Mediterranean Sea, E.	780	S.E.bS.	29
Cracow, Poland, E.	857	E.bS.	—
Cyprus I. Mediterranean Sea, E.	2000	S.E.bE.	35

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
D			
Dantzick, Poland, E.	776	E.bN.	13
Delly, Eaſt Indies, A.	2619	E.S.E.	—
Dierbeck, Turkey, A.	2278	E.S.E.	—
Dominica I. W. Indies	4210	S.W.bW.	47
Dreſden, Germany, E.	568	E.	—
Dublin, Ireland, E.	332	W.N.W.	9
E			
Edinburgh, Scotland, E.	331	N.N.W.	7
F			
Falkland Iſ. * S. A.	7980	S.S.W.	88
Ferro I. * Atlantic Ocean, Af.	1884	S.W.bS.	20
Flamborough Head, England, E.	161	N.	4
Formoſa I. China, A.	6670	E.bS.	172
G			
Gambia River, Guinea, Af.	2757	S.S.W.	31
Genoa, Italy, E.	645	S.E.	32
Gibraltar, Spain, E.	1104	S.bW.	20
Glaſgow, Scotland, E.	342	N.W.bN.	11
Gottenburgh, Sweden, E.	642	N.E.	9
Granada I. * Weſt Indies	4405	S.W.bW.	49
Grand Cairo, Egypt, A.	2249	S.E.	45
Good Hope, C. Af.	6068	S.bE.	80

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
Guernſey I. Britiſh Channel, E.	172	S.W.bS.	4
Gulf of Mexico, * America	4786	W.S.W.	54
H			
Hamburgh, Germany, E.	463	E.N.E.	8
Hanover, Germany, E.	360	E.bN.	—
Havannah, * Cuba I. Weſt Indies	4960	W.S.W.	56
Hiſpaniola I. * W. Indies	4341	S.W.bW.	49
Horn, Cape, S. A.	8900	S.W.bS.	104
I			
Iceland I. North Sea, E.	1024	N.N.W.	14
Iſpahan, Perſia, A.	2846	E.S.E.	—
J			
Jamaica I. * W. Indies	4765	S.W.bW.	53
Java I. Indian Ocean	7530	S.E.bS.	144
K			
Koningſburgh, Baltic, E.	900	E.bN.	13
L			
Leghorn, Italy, E.	780	S.E.	33
Lima, Peru, S. A.	6450	S.W.	141

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
Liſbon, Portugal, E.	1000	S.W.bS.	14
Liverpool, England, E.	180	N.W.	10
Lizard, England, E.	254	W.S.W.	6
M.			
Madeira I. *. Atlan. Ocean, Af.	2370	S.W.bS.	28
Madraſs, E. Indies, A.	5292	S.E.bE.	145
Madrid, Spain, E.	600	S.S.W.	—
Majorca I. Mediterranean Sea, E.	805	S.	26
Moldavia Iſ. Indian Ocean, A.	5236	S.E.bE.	133
Malta I. Mediterranean Sea, E.	1300	S.E.bE.	39
Manila, Manila I. A.	7163	E.S.E.	167
Mecca, Arabia, A.	3025	S.E.	133
Medina, Arabia, A.	2832	S.E.	—
Mexico, S. A.	6093	W.S.W.	—
Milan, Italy, E.	603	S.E.	—
Minorca I. Mediterranean Sea, E.	725	S.bE.	27
Mocha, Arabia, A.	3619	S.E.	126
N			
Nankin, China, A.	6095	E.bS.	208
Naples, Italy, E.	1000	S.E.	34
Naze * of Norway, E.	513	N.E.bN.	7
Newcaſtle upon Tyne, England, E.	246	N.bW.	5

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
New-York, * N. A.	3590	W.bS.	40
Nile River A.	2173	S.E.	44
Nubia, Ethiopia, Af.	2915	S.E.bS.	—
P			
Panama, Pacific Ocean, S. A.	5592	S.W.bS.	156
Pekin, China, A.	5510	E.bS.	—
Peterſburgh, Ruſſia, E.	1310	E.N.E	—
Plymouth, England, E.	218	E.S.E.	5
Point Look out, Greenland, E.	1820	N.N.E.	20
Pondicherry, E. Indies, A.	5267	S.E.bE.	146
Portſmouth, England, E.	76	S.W.	3
Prague, Bohemia, E.	642	E.bS.	—
Q			
Quebec, Canada, N. A.	3270	W.bS.	40
R			
Revel, Ruſſia, E.	1080	E.N.E.	15
Rhodes I. Mediterranean Sea, E.	1673	S.E.bS.	30
Riga, Ruſſia, E.	1050	E.N.E.	15
Rome, Italy, E.	857	S.E.bS.	33

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
S			
Sardinia I. Mediterranean Sea, E.	832	S.E.bS.	33
Scaw, Denmark, E.	602	N.E.	7
Shetland Iſ. North Sea, E.	662	N.bW.	9
Siam, Eaſt Indies, A.	6540	E.S.E.	163
Sicily I. Mediterranean Sea, E.	1174	S.E.bS.	32
Smyrna, Turkey, A.	1625	S.E.bE.	41
Sound, entrance into the Baltic	600	N.E.bE.	8
Spitſbergen, Greenland, E.	2032	N.N.E.	24
Stockholm, Sweden, E.	865	N.E.bE.	14
Straits of Babelmandel, entrance into Red Sea, A.	3707	S.E.	124
——— of Magellan, S. A.	8354	S.W.bS.	100
——— Sunda, between the Iſlands Sumatra and Java, Indian Ocean, A.	7521	S.E.bS.	146
Surat, Eaſt Indies, A.	4600	S.E.bE.	138
T			
Teneriff I. *Atlantic Ocean, Af.	1910	S.W.bS.	23
Turin, Italy, E.	585	S.E.bS.	—
V			
Valencia, Spain, E.	855	S.	26

Diſtance and Bearing from London, &c.

	Diſtance in Engliſh Miles.	Bearing.	Time of Sailing in Days.
Venice, Italy, E.	742	S.E.bE.	40
Vienna, Germany, E.	726	E.S.E.	—
W			
Warſaw, Poland, E.	877	E.	—
Whitby, England, E.	208	N.bW.	4
Whitehaven, England, E.	242	N.W.	11

The Time in Days multiplied by 80, gives the Nautical or Geographical Miles in the tract of Sailing, thus 145×80=11600, is the Geographical Miles in the Tract of Sailing from London to Madras.

A NUMBER OF ORIGINAL QUESTIONS AS OCCASIONAL EXERCISES.

1. A GENTLEMAN paid for an Eſtate twenty Thouſand and eight Pounds. For a Houſe, four Thouſand and twenty Pounds, eleven Shillings and four-pence; and for Furniture, three Thouſand two Hundred Pounds ſeven Shillings and Eight-pence; how much did he pay in the Whole?

Anſ. 27228*l.* 19*s.* 2*d.*

2. The Neptune having on Board 13 Ton 12 Hundred Weight 3 Quarters 14 Pounds of Sugar. The Reſolution 80 Tons 11 Hundred Weight. The Trident 56 Tons 10 Hundred Weight 3 Quarters 14 Pounds; and the Briton, one Hundred and ſeven Tons, and fourteen Pounds; how much Sugar was on Board theſe four Ships? *Anſ.* 257*t.* 14*cwt.* 3*qr.* 14*lb.*

3. A Wine-

3. A Wine-Merchant has 31 Hogſheads 41 Gallons 3 Pints of Claret; 17 Hogſheads 15 Gallons 3 Pints of Port; 40 Hogſheads 1 Pint of Burgundy; 16 Hogſheads of Maderia; and 104 Hogſheads 61 Gallons of other Kinds; required the Stock?
Anſ. 220*hhd.* 59*g.* 7*pts.*

4. One Army contained ſeventy Thouſand and two Hundred Men; in another there were ſixty-four Thouſand three Hundred and fifty-nine; how many did the Former exceed the Latter? *Anſ.* 5841.

5. At an Election which laſted three Days, the Numbers were as under.

	For Mr. Nemo.	For Mr. Dave.
1 Day	215	202
2 Day	249	261
3 Day	164	158

Required the Majority? *Anſ.* 7 for Mr. Nemo.

6. Subtract 9½*d.* from one Thouſand Pounds and Eight-pence? *Anſ.* 999*l.* 19*s.* 10½*d.*

7. Required the Product of 53034000 by 400600?
Anſ. 21245420400000.

8. A Gentleman went out with ten Guineas; he received from A 132 Pounds 10 Shillings and Sixpence; from B 40 Pounds, and from H 90 Pounds and Four-pence. He paid for 26½ Gallons of Brandy at 9 Shillings and Nine-pence per Gallon; for Timber he paid 40 Pounds 10 Shillings and Sixpence, and his Expences were 1 Pound 5 Shillings and Two-pence; how much Money did he return with? *Anſ.* 218*l.* 6*s.* 9½*d.*

9. Divide 6948 Pound among four Officers, A, B, C, D, and 60 Men; give A as much as 14 Men; B as much as 10 Men; C as much as 8 Men; and D as

much as 4 Men; required the Share of each Officer and Man?

Anſ. A 1013*l.* 5*s.* B 723*l.* 15*s.* C 579*l.* D 289*l.* 10*s.* and each Man 72*l.* 7*s.* 6*d.*

10. When two eighths of a Prize of Sixty Thouſand Pounds belong to 720 Men; how much is the Share of each? *Anſ.* 20*l.* 16*s.* 8*d.*

11. Three Brothers A, B, and C receive 35 Pounds amongſt them from their Father, who obſerves that if A ſpends 7 Shillings and Sixpence per day; B 5 Shillings and Sixpence; and C 4 Shillings and Sixpence, they will all be without Money on the ſame Day; how much did each receive, and in how many Days will the Money be all ſpent?

Anſ. A 15*l.* B 11*l.* C 9*l.* and 40 Days.

12. How many Pounds are in three Hundred and fifty-two Thouſand two Hundred and ninety-four Farthings? *Anſ.* 366*l.* 19*s.* $5\frac{1}{2}$*d.*

13. Reduce $\frac{224}{352}$ into its leaſt Terms. *Anſ.* $\frac{7}{11}$.

14. What is the Proportion or Ratio between 96 and 32; Alſo what is the Ratio between 63 and 42; and between 456 and 428?

Anſ. 3 to 1; 3 . . 2. and 144 . . 107.

15. Required the Sum of $90\frac{2}{7}$, $41\frac{7}{12}$, and $3\frac{8}{9}$?

Anſ. $135\frac{191}{252}$.

16. Subtract $12\frac{3}{4}$ from $20\frac{1}{8}$? *Anſ.* $7\frac{3}{8}$.

17. Multiply $6\frac{4}{5}$, $9\frac{2}{3}$, $1\frac{7}{8}$ and $2\frac{3}{4}$ into one Product.

Anſ. $338\frac{15}{16}$.

18. Divide $\frac{2}{3}$ of $72\frac{1}{5}$ by $\frac{4}{5}$ of $9\frac{1}{2}$. *Anſ.* $6\frac{1}{3}$

19. Add 132.75*l.* 64*l.* 17*s.* 6*d.* 41.875*l.* and $99\frac{1}{8}$ into one Sum. *Anſ.* 330*l.* 12*s.* 6*d.*

20. Subtract 41.75 from 52. *Anſ.* 10.25.

21. Required the Product of .22585 by $\frac{2}{5}$?

Anſ. .090340.

22. Divide 13.575 by 8.2432. *Anſ.* 1.64+

23. How much do 9 Hundred 2 Quarters 17 Pounds of Sugar come to at Seven-pence per Pound?

Anſ. 31*l.* 10*s.* 7*d.*

24. Bought 7 Hundred 2 Quarters 15 Pounds Weight of Goods at 1*l.* 12*s.* 8*d.* per Hundred Weight. Sold two-fifths of it at 2*l.* 2*s.* per Hundred Weight; four-ninths of them at 11*s.* 8*d.* per Quarter, and the Remainder at 4*d.* per Pound; required the whole Gain, and Gain per Cent.?

Anſ. Whole Gain 4*l.* 1*s.* 6½*d.* Gain per Cent. 32*l.* 13*s.* 11¾*d.*

25. A bought 624 Yards of Muſlin at 7*s.* per Yard. He ſold 200 Yards at 8*s.* 4*d.* 180 Yards at 9*s.* and the Remainder ſo, that he gained in all, the ſame as if he had ſold all his Muſlin at 8*s.* 3*d.* per Yard; how did he ſell his laſt Parcel? *Anſ.* 7*s.* 7⅖*d.* per Yard?

26. A Grocer bought 600 Pounds of Sugar at 8*d.* per Pound. He ſold 120 Pounds at 10*d.* but the Price falling, he wiſhes to ſell the Remainder ſo as to gain 10*l.* per Cent. by the 600 Pounds of Sugar; how muſt he ſell the Remainder? *Anſ.* 8½*d.* per Pound.

27. In what Time will a Sum of Money lent at 4 per Cent. Simple Intereſt, gain three-fifths of the Principal? *Anſ.* In 15 Years.

28. How often will a Coach-wheel move round in travelling from London to Newcaſtle, which is 272 Miles, the Circumference of the Wheel being 18 Feet?

Anſ. 79786⅔.

29. A whimſical Gentleman has a Ciſtern with 6 Cocks; A can fill the Ciſtern in 6 Hours, B in 8, and C in 10; D can empty it when full in 4 Hours, E in 12, and F in 20. If the Ciſtern be empty, and all the Cocks be ſet open, in what Time will it be full?

Anſ. In 120 Hours.

30. A Gentleman being aſked his Age, ſaid that if two-thirds of 2016 be added to 18 Times the Square of

his Age, the Sum will be two-thirds of the Cube of 24; how old is he? *Anſ.* 22 Years.

31. Bought 7 Pieces of Holland, each containing 30 Ells Flemiſh at 2*s.* per Ell, and ſold it 3*s.* 6*d.* per Yard; required the whole Gain, and Gain per Cent.?

Anſ. 6*l.* 6*s.* and 30*l.* per Cent.

32. Divide 282*l.* amongſt A, B, and C, ſo that B may have three-fourths of A's, and C 4*l.* 10*s.* more than three-fourths of B's.

Anſ. A 120*l.* B 90*l.* and C 72*l.*

33. If I can buy $\frac{3}{16}$ of a Ship for 150, what Share can I have for 240*l.*? *Anſ.* $\frac{3}{10}$, which is $\frac{4}{10}+\frac{1}{20}$.

34. Whether is $\frac{2}{7}$ of 100, or $\frac{3}{13}$ of 120, the greater?

Anſ. The Difference is $\frac{80}{91}$ in favor of the former.

35. Concerning the two Numbers 48 and 36, anſwer theſe Queries; what is their Sum; their Difference; their Product; their Quotient; the Sum of their Squares; the Difference between their Squares; the Square Root of the Sum of their Squares, and the Cube Root of their Product?

The Anſwers are reſpectively 84, 12, 1728, $1\frac{1}{3}$, 2304, 1008, 60, and 12.

36. If two Men ſet out together the ſame Way, one to go every Day 20 Miles, the other 12 Miles the firſt Day, 14 the next, and ſo on increaſing 2 Miles every Day. In how many Days from their ſetting out together, will they be together again?

Anſ. 9 Days, each having travelled 180 Miles.

FINIS.